How and why do podiatrists promote physical activity?

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Abstract

Background: Physical inactivity is a serious health issue. Not only is it the fourth leading risk factor contributing to death and the burden of disease globally (Lee et al. 2012), but regular physical activity has numerous benefits for health and well-being. Health professionals are ideally placed to provide primary, secondary and tertiary prevention of many chronic diseases through the promotion of physical activity. While the factors that influence some health professionals have been studied, little is known about podiatrists' physical activity promotion behaviours. Therefore, it is important to understand how and why health professionals, particularly podiatrists, engage in physical activity promotion.

The overall objective of this thesis was to explore and understand the factors that influence podiatrists' physical activity promotion behaviours. The specific aims were:

1. To identify the current status of physical activity promotion in podiatry in Australia;
2. To identify Australian podiatrists' attitudes and beliefs regarding physical activity promotion;
3. To identify patients' experiences and perceptions of podiatrists' physical activity promotion;
4. To identify the factors that influence podiatrists to engage in the promotion of physical activity.

Method: A pragmatic paradigm that employs both qualitative and quantitative methods was used to study physical activity promotion by podiatrists. The focus was on factors related to the podiatrist and their patients, and elements of the theory of planned behaviour were used to help explain behaviour.

A systematic review of the literature was conducted to determine the factors associated with non-medical health professionals' engagement in physical activity promotion (Chapter 3). Qualitative

data were collected in a study that involved semi-structured interviews with 20 purposefully selected podiatrists that aimed to identify podiatrists' physical activity assessment and promotion practices, the barriers and enablers facing them and their salient beliefs about and attitudes towards physical activity promotion and their role (Chapter 4). These two inductive studies helped to inform a quantitative survey study that aimed to describe the current status of 316 podiatrists' physical activity promotion practices, identify their attitudes, social norms, confidence, control over, perceived knowledge and skills, role beliefs, perceived barriers, and past training regarding physical activity promotion (Chapter 5). Furthermore, it aimed to identify the factors associated with podiatrists' engagement in physical activity promotion. Finally, a quantitative survey study of 170 podiatry patients aimed to provide an understanding of the physical activity promotion interaction from patients' point of view (Chapter 6). This study included collecting data on perceptions of the physical activity promotion role of podiatrists, experiences of the physical activity promotion behaviours of podiatrists, and perceptions of the effectiveness of and satisfaction with physical activity promotion provided by podiatrists.

A range of methods were used in the analysis and interpretation of the data including thematic analysis, descriptive statistics, factor analysis and structural equation modelling.

Key findings were:

- Amongst non-medical health professionals, self-efficacy in physical activity promotion, positive beliefs in the benefits of physical activity, assessing patients' physical activity level, and physical activity promotion training were the main factors associated with engaging in physical activity promotion, while a lack of remuneration was not (Chapter 3).

- Podiatrists generally engage and are confident in carrying out rudimentary physical activity promotion activities, such as asking a patient about physical activity and giving general

physical activity advice, but are less confident or less likely to assess physical activity levels, provide specific advice, follow up patient physical activity levels, carry out physical activity counselling or refer to other health or exercise professionals (Chapters 4, 5 and 6).

- Podiatrists' attitudes to physical activity promotion were mostly positive and most agree it is part of their role (Chapters 4 and 5).

- Many podiatrists report a lack of guidelines, patient interest and resources as major barriers to physical activity promotion (Chapters 4 and 5).

- Behavioural beliefs, outcome evaluations and behavioural control were significantly associated with the level of physical activity promotion provided by podiatrists (Chapter 5).

- Patients are broadly supportive of the physical activity promotion actions of podiatrists and see that podiatrists have a role to play in physical activity promotion (Chapter 6).

- Many patients report discussing physical activity with their podiatrist, however, many patients report not receiving any advice about physical activity, and if they do, the level of delivery they receive appears rudimentary (Chapter 6).

- Patients are mostly satisfied with the advice they receive, finding it useful and believing that they would act upon it (Chapter 6).

Conclusion: This study is the first internationally to describe the current status of podiatrists' engagement in physical activity promotion, and identify factors associated with physical activity promotion in this setting. Physical activity promotion appears feasible in podiatry practice in terms

of opportunity and acceptability to both practitioners and patients. Many Australian podiatrists are engaged in physical activity promotion, however, the levels of promotion are underdeveloped. Positive attitudes to and greater confidence in delivering physical activity promotion were key factors associated with podiatrists' physical activity promotion behaviours. This study demonstrated that podiatrists are in a unique position to promote physical activity, and that physical activity promotion in this setting is supported by both podiatrists and patients. Identifying effective strategies for increasing physical activity promotion among podiatrists is the next critical step towards improving the health and wellbeing of podiatry patients through increased physical activity.

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Statement of co-authorship

Paul Crisford (PC) has been fully involved in and responsible for all facets of the project, including the development of the individual study protocols, questionnaires, interview schedules, funding applications, ethics approval, participant recruitment, data collection, data cleaning and data analysis, and preparation of manuscripts for publication and conference presentations. This thesis was completed with the advice, support and guidance of my supervisory team, Dr Verity Cleland (VC), Dr Dawn Aitken (DW), Professor Tania Winzenberg (TW) and Professor Alison Venn (AV).

Chapter 3

Crisford, P., T. Winzenberg, A. Venn, M. Schultz, D. Aitken and V. Cleland (2018). 'Factors associated with physical activity promotion by allied and other non-medical health professionals: A systematic review'. Patient Education and Counseling **101**(10): 1775-1785.

The development of this study was the responsibility of PC, in collaboration with VC, DW and TW. Martin Schultz (MS) assisted with the search of the literature and DW assisted with the data extraction and analysis. PC, VC, AV, MS and TW contributed to drafting of the manuscript. All authors read and approved the final manuscript for publication.

Chapter 4

Crisford, P., T. Winzenberg, A. Venn and V. Cleland (2013). 'Understanding the physical activity promotion behaviours of podiatrists: a qualitative study'. Journal of Foot and Ankle Research **6**(1): 37.

The development of this study was the of PC, in collaboration with VC, AV and TW. PC was responsible for all the recruitment of study participants, data collection, cleaning and analysis. Pam

Reid and Christine Caladine assisted in the data collection and analysis. PC, VC and TW contributed to drafting of the manuscript. All authors read and approved the final manuscript for publication.

Chapter 5

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PC was responsible for all the recruitment of study participants, data collection, cleaning and analysis. PC, VC, DA and TW contributed to drafting of this chapter.

Chapter 6

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Signed by primary supervisor Dr Verity Cleland

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Signed by Deputy Director of Menzies Institute for Medical Research Professor Graeme Zosky

Signed:

Abbreviations/Glossary

ABS	Australian Bureau of Statistics
AHS	Australian Health Survey
AIHW	Australian Institute of Health and Welfare
AUS$	Australian Dollars
BMI	Body Mass Index
DALY	Disability-adjusted life years: A year of healthy life lost, either through premature death or equivalently through living with disability due to illness or injury.
EU	European Union
GP	General Practitioner
INT$	International dollar: A comparable amount of goods and services a U.S. dollar would buy in the United States
HRQL	Health Related Quality of Life
MET	Metabolic Equivalent of Task
NICE	The National Institute for Health and Care Excellence
PA	Physical Activity
UK	United Kingdom
US	United States
WHO	World Health Organisation

Publications and presentations

Publications arising directly from the research described in this thesis

Chapter 3

Crisford, P., T. Winzenberg, A. Venn, M. Schultz, D. Aitken and V. Cleland (2018). 'Factors associated with physical activity promotion by allied and other non-medical health professionals: A systematic review'. Patient Education and Counseling 101(10): 1775-1785.

Chapter 4

Crisford, P., T. Winzenberg, A. Venn and V. Cleland (2013). 'Understanding the physical activity promotion behaviours of podiatrists: a qualitative study'. Journal of Foot and Ankle Research 6(1): 37.

Conference presentations arising from this thesis

*****Presenting author

Paul Crisford*, Tania Winzenberg, Alison Venn, Verity Cleland. 'Understanding the physical activity promotion behaviours of podiatrists: A qualitative study'. Poster presentation. International Society for Physical Activity and Public Health Scientific Meeting, Sydney, October 2012.

Paul Crisford*, Tania Winzenberg, Alison Venn, Verity Cleland. 'Understanding the physical activity promotion behaviours of podiatrists: A qualitative study'. Oral presentation. Australasian Podiatry Conference, Sydney, June 2013.

Paul Crisford*, Tania Winzenberg, Alison Venn, Martin Schultz, Dawn Aitken, Verity Cleland. 'Factors associated with physical activity promotion in the allied health setting: A Systematic Review'. Oral presentation. Sports Medicine Australia National Conference, Sanctuary Cove, October 2015.

Paul Crisford*, Tania Winzenberg, Alison Venn, Martin Schultz, Dawn Aitken, Verity Cleland. 'Factors associated with physical activity promotion amongst non-medical health professionals'. Oral presentation. 9th World Congress on Active Ageing, Melbourne, July 2016.

Paul Crisford*, Tania Winzenberg, Alison Venn, Martin Schultz, Dawn Aitken, Verity Cleland. 'Factors associated with physical activity promotion amongst non-medical health professionals'. Oral presentation. Tasmanian Allied Health Symposium, Hobart, November 2017.

Paul Crisford*, Tania Winzenberg, Alison Venn, Verity Cleland. 'Physical activity promotion in the podiatric setting'. Oral presentation. Tasmanian Podiatry Conference, Hobart, October 2018.

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Preface

The wise have always known about the benefits of physical activity:

> "All parts of the body which have a function, if used in moderation and exercised in labors in which each is accustomed, become thereby healthy, well developed and age more slowly, but if unused they become liable to disease, defective in growth and age quickly".
> (Hippocrates 460 BC – 370 BC)

But, the modern world with its labour-saving devices and life-extending medical interventions diverts our attention from the importance of physical activity. Exercise is medicine and all health professionals have a responsibly to promote it.

I initially became interested in the issues surrounding physical inactivity and the benefits of activity with my involvement with Sports Medicine Australia (SMA). SMA is a multidisplinary association whose vision is to share knowledge, training and information, to enhance the health of all Australians and prevent lifestyle diseases through facilitating their safe participation in sport and physical activity. Attending many physical activity related SMA conference presentations made me curious about the podiatrists' role. I was surprised about the lack of any information about if, how, why and what podiatrists do in regards to promoting physical activity.

In late October 2010 I embarked on developing this project after presenting my idea at a meeting with Professor Alison Venn, the then Deputy Director of the Menzies Institute for Medical Research. It has been a huge challenge, working full time, being involved in family activities, and dedicating my spare time to a PhD (and of course keeping physically active). Nonetheless, I have always felt it worthwhile. If this work improves the level of physical activity promotion in podiatry and helps

people become more active and maintain their activity throughout life, then it is definitely worthy. I believe this work has the potential to improve the lives of many people, not only here in Australia, but worldwide.

Two of the project studies have been published and a further two will be submitted for publication in the near future. Therefore, the results chapters of this thesis are structed as individual manuscripts.

I hope you enjoy your reading.

Paul Crisford

Chapter 1 - Introduction

Low levels of physical activity have serious health consequences of pandemic proportions (Kohl et al. 2012). The promotion of physical activity has never been more necessary with evidence supporting that physical inactivity is one of the most important public health problems of the 21st Century (Blair 2009).

The promotion of physical activity in health care is an obvious approach given the potential risk of inactivity and potential benefits of regular physical activity for health and wellbeing. Yet universal uptake of its practice remains unsubscribed amongst many health professionals.

Little is known about physical activity promotion in the podiatry profession. The objective of this thesis was to identify the current status of, beliefs about, and facilitators and barriers to physical activity promotion in podiatry.

This thesis consists of seven chapters including an introduction (Chapter 1), methods (Chapter 2), one results chapter for each individual study (Chapters 3,4, 5 and 6) and a discussion (Chapter 7).

Defining physical activity

Physical activity is defined as “any bodily movement produced by skeletal muscles that results in energy expenditure and can be measured in kilocalories” (Caspersen et al. 1985). It is important to distinguish the difference between physical activity, exercise and physical fitness. These terms are often incorrectly used interchangeably (Caspersen et al. 1985). Exercise is a subset of physical activity that is planned, structured, and repetitive and has as a final or intermediate objective to improve or maintain physical fitness. Physical fitness is a set of

attributes that are either health-or skill-related and the degree to which people have these attributes can be measured with specific tests. Physical activity can be categorised into domains of occupational, leisure-time, transport or household/domestic activities. Physical activity can be measured by metabolic equivalent units (METs) and this thesis uses the intensity of activity terminology as proposed in a position statement on physical activity and exercise intensity (Norton et al. 2010) which proposes five intensity categories ('sedentary', 'light', 'moderate', 'vigorous' and 'high' intensity activities) and specific objective physiological and metabolic guidelines (Appendix 1.1).

The risks of inactivity

The risks of physical inactivity are well known. Early seminal studies alerted the scientific community to the serious detrimental health impact of physical inactivity. One of the first was a study by Morris et al(Morris et al. 1966) that showed that physical activity and exercise protects against coronary heart disease by demonstrating an increased risk of coronary heart disease in London bus drivers compared with conductors. This work was followed with works by Paffenbarger et al.(Paffenbarger Jr et al. 1970) that studied the activity of longshoremen and later by another study involving the longevity of college alumni(Paffenbarger Jr et al. 1986). These studies began the exponential growth in scientific evaluation of physical inactivity and its risks.

Physical inactivity is the fourth leading risk factor contributing to deaths and the burden of disease globally, ranking ahead of overweight or obesity, and is responsible for 9% of premature mortality or over 5.3 million deaths in 2008 (Lee et al. 2012). More specifically,

when referring to the burden of particular chronic diseases, inactivity accounts for 7% of the incidence of type 2 diabetes, 10% of breast cancer, and 10% of colon cancer (Lee et al. 2012).

In Australia in 2011, one-third of chronic disease burden related to physical inactivity was due to coronary heart disease (33.6%), followed by dementia (18%), diabetes (16%), bowel cancer (13%) and stroke (12%) (Australian Institute of Health and Welfare 2017). As shown in Figure 1.1, the burden due to physical inactivity on Disability-Adjusted Life Year (DALY) rates increases with age in men up to age 74, with most of the burden experienced between ages 55 and 84. In women, the attributable burden increases with age, with most of the burden experienced in ages 75 and over.

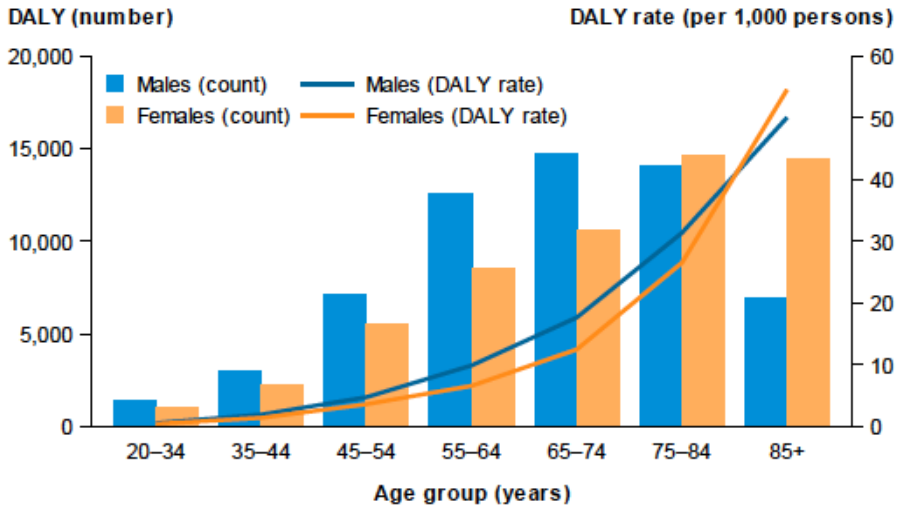

Figure 1-1 Burden (Daly and Daly rate 1,000 persons) attributed to physical inactivity, by age and sex

Source: Australian Institute of Health and Welfare. 2017. 'Impact of physical inactivity as a risk factor for chronic conditions: Australian Burden of Disease Study. Australian Burden of Disease Study series no.15 Cat. no. BOD 16. Canberra: AIHW.

The costs of inactivity

Besides the burden on the individual, physical inactivity is responsible for a substantial economic burden which is conservatively estimated to have cost health-care systems internationally (INT$) 53.8 billion in 2013, with an additional INT$ 14 billion attributable to lost productivity (Ding et al. 2016). The economic burden of physical inactivity (Ding et al. 2016) report finds that the total cost burden of physical inactivity on the Australian economy was $805 million, including $640 million in direct costs and $165 million in productivity losses.

Physical activity benefits

Primary prevention of disease

In 1995 the American College of Sports Medicine and the Centers for Disease Control and Prevention made recommendations based on reviewed physiological, epidemiological and clinical evidence that adopting a more active lifestyle would enable individuals to reduce their risk of chronic disease and may contribute to enhanced quality of life (Pate et al. 1995). Many other reviews (Beydoun et al. 2014; Blondell et al. 2014; Brown et al. 2013; Guure et al. 2017; Haskell et al. 2007; Howe et al. 2011a; Kyu et al. 2016; Lear et al. 2017; Mammen et al. 2013; Paterson et al. 2010; Pedersen et al. 2015; Powell et al. 2011; Sherrington et al. 2011; Tak et al. 2013; Teychenne et al. 2008; Warburton et al. 2006; Warburton et al. 2017) have examined the dose and expanded the evidence on the benefits of physical activity for the primary prevention of various conditions. These reviews provide strong evidence for the role of physical activity in the prevention of mortality and many chronic diseases including; cardiovascular disease (including ischemic heart disease, stroke and peripheral vascular disease), diabetes, cancer (particularly breast and colon cancer), obesity, osteoporosis,

sarcopenia, falls, fractures, functional disability, cognitive decline, dementia, Alzheimer's disease and depression.

Secondary and tertiary prevention

There is also strong evidence for the secondary and tertiary prevention benefits of physical activity. While it is important to provide broad preventative strategies to all individuals throughout the lifecourse, it is equally pertinent to focus on reducing the impact on those patients who already present with chronic disease. Many chronic conditions are drastically improved when physical activity and exercise are part of a medical management plan (Durstine et al. 2013).

In Australia, one in two individuals are estimated to have at least one of eight selected common chronic conditions: cancer, cardiovascular disease, mental health conditions, arthritis, back pain and problems, chronic obstructive pulmonary disease, asthma and diabetes (Australian Institute of Health and Welfare 2018). Nearly one in four (23%) Australians are estimated to have two or more of these conditions. One in twenty (1.2 million) adults self-report having diabetes, one in three (6.9 million) people have arthritis and other musculoskeletal conditions, such as back pain, arthritis and osteoporosis.

People are living longer, with global numbers of adults aged 65 years and older projected to double to approximately two billion by 2050 (World Health Organization 2015). With increasing age also comes physiological change and an increased presence of chronic disease. Prevalence of multimorbidity (the coexistence of multiple chronic diseases) in older persons ranges from 55 to 98% (Marengoni et al. 2011) and is reported to increase with age, from 50% for persons under age 65 years to 62% for those aged 65–74 years and 81.5% for those aged

≥85 years (Salive 2013). Furthermore, according to a study in the Netherlands (Uijen et al. 2008), the prevalence of chronic diseases doubled and the proportion of patients with four or more chronic diseases tripled in the period between 1985 and 2005.

There have been calls to place more emphasis on delaying the effects of morbidity by reducing frailty and dependency and to maintain independent physical and cognitive function and mental health and well-being (Bauman et al. 2016). One of the most important approaches to reduce morbidity is to increase physical activity.

There is strong evidence across many studies and a range of outcome measures that physical activity is related to reduced impairment, improved functional independence and quality of life (Bauman et al. 2016; Chodzko-Zajko et al. 2009; Liu et al. 2009; Motl et al. 2010; Nelson et al. 2007; Paterson et al. 2010; Tak et al. 2013), including in the frail (Chou et al. 2012) and very old (Stessman et al. 2009). It is thought that physical activity is the most important determinant of active aging[1] and has a major role in improving the quality of life, in reducing disability, and in the "compression of morbidity" in later life (Crimmins 2015; Kalache et al. 2002).

The evidence warrants promoting physical activity to reduce the effects and for the ongoing management of patients suffering from numerous chronic conditions. Physical activity has been shown to provide significant benefits in the treatment and management of; cholesterol (Lin et al. 2015; Mann et al. 2014), stroke (Billinger et al. 2014; Pang et al. 2006; Peurala et al. 2014; Saunders et al. 2016; Veerbeek et al. 2011), type 2 diabetes (Chodzko-Zajko et al. 2009;

[1] "Active aging", first defined by the World Health Organisation (World Health Organization 2002)

Colberg et al. 2016; Conn et al. 2007; Gordon et al. 2009; Lin et al. 2015; Manders et al. 2010; Thomas et al. 2006; Umpierre et al. 2011), type 1 diabetes (Yardley et al. 2013), intermittent claudication (Lane et al. 2014; Parmenter et al. 2015), peripheral neuropathy (Balducci et al. 2005; Kingsley et al. 2015; Singh et al. 2005), cancer (Cormie et al. 2018; Cormie et al. 2017), osteoarthritis in the knee and hip joints (Bennell et al. 2011; Fransen et al. 2015; Roddy et al. 2005; Zhang et al. 2010), low-back pain (Chou et al. 2017; Hayden et al. 2005; Maher et al. 2017; Steffens et al. 2016), osteoporosis (Howe et al. 2011b), disability (Paterson et al. 2010; Tak et al. 2013), chronic fatigue syndrome (Larun et al. 2017), cognitive decline (Groot et al. 2016; Paterson et al. 2010), depression (Blake et al. 2009; Cooney et al. 2014; Craft et al. 1998; Daley 2008; Josefsson et al. 2014; Schuch et al. 2016), anxiety (Conn 2010; Herring et al. 2010) and stress (Pedersen et al. 2015).

In addition, these benefits extend beyond physical health to other domains such as Health Related Quality of Life (HRQL) which encompasses the perceived valued health attributes such as the sense of comfort or well-being, the ability to maintain good physical, emotional, and intellectual functions, and the ability to satisfactorily take part in social activities (Anokye et al. 2012; Bize et al. 2007). Reviews demonstrate positive effects of physical activity on HRQL and psychological well-being in older people (Motl et al. 2010; Netz et al. 2005; Rejeski et al. 2001). An eight-year follow-up study (Lampinen et al. 2006) indicated that higher leisure activity, better mobility status, a low level of chronic conditions, and physical activity indirectly, are associated with and predict mental well-being in later life. In addition, more leisure time physical activity and less leisure time sedentary behaviour were independently associated with better long-term HRQL in older adults (Balboa-Castillo et al. 2011).

Physical activity recommendations

Recommendations are intended for use by all health professionals who have a role in advising their patients on physical activity and sedentary behaviour (Brown et al. 2013).

In 1995 the Centers for Disease Control and Prevention and the American College of Sports Medicine issued a public health recommendation that ‘‘Every US adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week’’ (Pate et al. 1995). The purpose of the recommendation was to provide a ‘‘clear, concise, public health message’’. In general, these recommendations have been widely adopted by national and international organisations. Recommendations from the World Health Organisation (World Health Organization 2010), Canada (Canadian Society for Exercise Physiology 2018), United Kingdom (Australian Government Department of Health 2017; Department of Health and Social Care Gov. UK 2011) and most European countries (Kahlmeier et al. 2015) follow the guideline of 150 minutes or more of moderate activity per week.

Additional recommendations of limiting sedentary behaviour and including muscle and bone strengthening activities on at least 2 days a week have been added to guidelines internationally (Appendix 1.2).

Specific physical activity recommendations are given for children, adolescents and older adults (Bauman et al. 2016; Buchner 2009; Buman et al. 2010; Nelson et al. 2007; Paterson et al. 2010), as well as for specific conditions such as diabetes and cancer (Rock et al. 2012; Winters-Stone et al. 2013). The Australian recommendations (Australian Government Department of Health 2017) for older adults differs from younger adults in that older adults should do some form of physical activity, no matter what their age, weight, health problems or abilities, should

be active every day in as many ways as possible, doing a range of physical activities that incorporate fitness, strength, balance and flexibility. Older people who have stopped physical activity, or who are starting a new physical activity, should start at a level that is easily manageable and gradually build up to the recommended amount, type and frequency. Older people who continue to enjoy a lifetime of vigorous physical activity should carry on doing so in a manner suited to their capability into later life, provided recommended safety procedures and guidelines are adhered to.

How much physical activity is enough?

The relationship between dose and benefit is generally curvilinear with the greatest relative health benefits occurring at relatively low physical activity levels as shown in Figure 1.2. Major gains are seen to occur at lower levels of activity, up to 3000-4000 metabolic equivalent (MET)minutes/week, however higher levels of total physical activity are also associated with lower risk of all outcomes (Kyu et al. 2016). It is suggested that as little as 15 minutes a day or 90 minutes a week of moderate-intensity exercise might be of benefit, even for individuals at risk of cardiovascular disease (Wen et al. 2011). In a review of reviews (Warburton et al. 2016a) it suggests that health benefits can be achieved at physical activity volumes that are half (or less) of the current international recommendations. This is also the case for older adults where evidence suggests that there may be protective benefits at levels of physical activity well below current recommendations and that even low doses should be encouraged amongst this age group (Hupin et al. 2015).

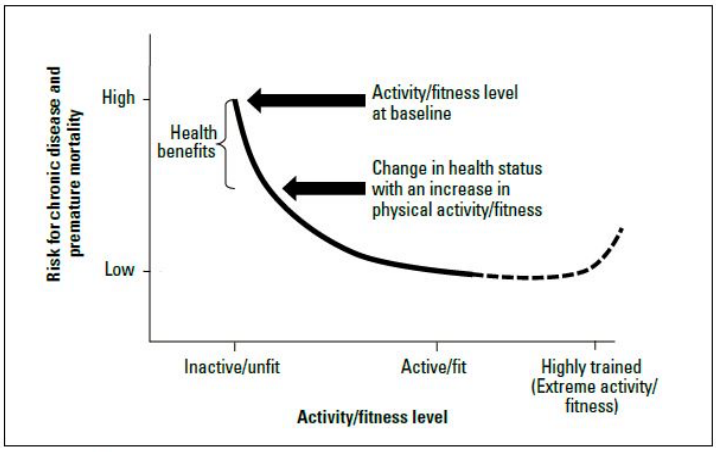

Figure 1-2 Dose response curve

Theoretical dose-response relationship between physical activity/fitness and health status. In individuals who are physically inactive/ unfit, a small change in physical activity/fitness will lead to a significant improvement in health status including a reduction in the risk for chronic disease and premature mortality. Dashed line represents the potential attenuation in health status seen in highly (extremely) trained endurance athletes.
Source: Warburton, Darren ER, and Shannon SD Bredin. 2016. 'Reflections on physical activity and health: what should we recommend?', Canadian Journal of Cardiology, 32: 495-504.

In Australia, the Burden of Disease Study (Australian Institute of Health and Welfare 2017) suggests that if everyone in the population 'at risk' did an extra 15 minutes of moderate activity five days per week, 13% of the potential disease burden due to physical inactivity could be avoided in 2020, compared with what would be the case if current trends continued. Females showed the greatest benefit in this scenario, with 24% of the burden due to physical inactivity potentially avoided in 2020. In terms of the relative proportion of DALY avoided within each age group, this analysis suggests that the largest gains could be made by those aged 65–74 years, where 19% of potential disease burden due to physical inactivity could be avoided.

Current physical activity levels

Modern society and physical activity levels

Since the industrial revolution, human energy expenditure requirements have reduced due to increased mechanisation, automotive transportation, urbanisation, technological advances and widespread adoption of sedentary activities and labour-saving devices. There have been significant changes to occupational and lifestyle activities that are major contributors to the decline in physical activity by individuals.

A report by the Lancet Physical Activity Series Working Group (Hallal et al. 2012), using data from 122 countries worldwide, revealed that a third of adults and four-fifths of adolescents did not achieve recommended levels of physical activity. Women were more inactive (33.9%) than men (27.9%), inactivity increased with age and was more common in countries of high income than those of low income. The proportion of adults spending four or more hours per day sitting was 41.5%. This report acknowledges the limitations in using self-report for measuring physical activity including the potential for over-reporting of physical activity and under-reporting of sedentary behaviour. Studies (Hansen et al. 2012) using objective measures including accelerometer-derived measures show considerably lower levels of physical activity amongst population groups than self-report methods.

In the United States, only 22.9% of adults aged 18–64 met the guidelines for both aerobic and muscle-strengthening activities during leisure time physical activity in 2010–2015 (Blackwell 2018).

In the most recent review of physical activity behaviour of older adults, up to 83% did not meet physical activity recommendations (Sun et al. 2013). In addition, a review of the amount

of sedentary behaviour of older adults (10 countries and one European Union-wide) (Harvey et al. 2015) found that 60% reported sitting for more than 4 hours per day; however, when objectively measured, older adults were found to spend an average of 9.4 hours a day sedentary, equating to 65–80% of their waking day.

As reported by the Australian Bureau of Statistics (Australian Bureau of Statistics 2015b), in 2014-15, 55.5% of 18-64 year-olds participated in sufficient physical activity in the last week (defined as meeting National Physical Activity Guidelines). Nearly one in three (29.7%) 18-64-year-olds were insufficiently active (less than 150 minutes in the last week) while 14.8% were inactive (no exercise in the last week) and only one in four (24.9%) older adults did at least 30 minutes of exercise on five or more days in the last week. In addition, less than 19% of adults (18-84 years) met the strength training guidelines (Bennie et al. 2015) and only one in eight older people participated in strength training (Merom et al. 2012). According to a national pedometer study (Australian Bureau of Statistics 2012b), Australian adults took an average of 7,400 steps per day with less than one in five adults (19%) recording 10,000 per day on average.

All healthcare professionals have a role in physical activity promotion

There is substantial evidence for the benefits of increasing physical activity levels of individuals and a need for an effective comprehensive approach (Global Advocacy for Physical Activity 2012). One major strategy is to encourage healthcare professionals to assess physical activity levels of their patients and provide appropriate physical activity recommendations, advice and counselling.

A healthcare consultation provides an ideal opportunity to promote physical activity. International (World Health Organization 2006, 2018) and national (National Heart Foundation of Australia 2009; The National Physical Activity Plan Alliance 2016) frameworks for physical activity promotion highlight the critical role of health professionals in promoting physical activity. It is claimed that health professionals are important influencers of patient behaviour and key initiators of non-communicable disease prevention actions within the health care system, and that they can influence large proportions of the population (Global Advocacy for Physical Activity 2012). Furthermore, health professionals can provide positive messages about physical activity that are important for primary, secondary and tertiary prevention of many health conditions. Therefore, it is recommended that all health professionals not only engage in the promotion of physical activity with their patients, but also routinely counsel patients to adopt and maintain regular physical activity (Pate et al. 1995; Weiler et al. 2012). However, in 2012, only 36.3% of adult Americans who had received healthcare in the past twelve months reported having been told by a healthcare professional to increase their exercise. Among adults reporting no exercise engagement, only 44.9% had been told by a health care professional to increase their exercise levels (Loprinzi et al. 2014). Furthermore, less than 40% of people with prediabetes receive advice to increase their physical activity (Yang et al. 2011).

Promoting physical activity in the clinical setting

There are a number of widely accepted individual strategies used in clinical practice to promote physical activity and a number of strategies that have been found to be effective in increasing patient activity levels (Richards et al. 2016; Sanchez et al. 2015), at least in the short term. It should be noted, however, that there is a general lack of quality studies, mixed levels of evidence, a lack of homogeneity of studies, and that the reporting of the content of the

promotion in the studies is often brief and imprecise as well as broadly characterized or lacking detail (Michie et al. 2011). This makes it difficult to make definitive judgements about the best strategy for effective physical activity promotion in clinical practice. Presented below are some of the more common strategies that could be suitable for integration into a one-on-one consultation.

Physical activity assessment

The strategy of asking a patient about or assessing his/her current physical activity level is considered the first step in identifying patients in need of physical activity promotion. It is recommended that a patient's physical activity level become a vital sign at every consult (Khan et al. 2011). The World Health Organization has proposed the implementation of national standardised protocols for the assessment of patients' physical activity in primary health, particularly including the physical activity capacity of older adults (World Health Organization 2018). Currently, there are a number of tools and methods, both objective and subjective, available to identify those who can benefit from physical activity and to monitor their physical activity levels.

A 2017 systematic review (Smith et al. 2017) identified tools that can be used to assess physical activity in primary care. These included the General Practice Physical Activity Questionnaire (GPPAQ), GPPAQ-walk, the Brief Physical Activity Assessment Tool (BPAAT), the Physical Activity Vital Sign (PAVS), the Speedy Nutrition and Physical Activity Assessment (SNAP) tool, the Rapid Assessment Disuse Index (RADI) and the 7-Day Physical Activity Recall (7DPAR). GPPAQ was most frequently reported. However, none of the assessment tools identified showed high reliability and validity and it was concluded that the evidence is insufficient to inform current practice. Simpler questionnaires involving either one (Milton et al. 2011; Milton et al. 2013), two or three (Coleman et al. 2012; Greenwood et al. 2010;

Marshall et al. 2005; Smith et al. 2005) questions, performed as well as other short physical activity tools in terms of reliability and validity, and appear to be more feasible for clinical practice. In addition, general practitioners own assessment techniques had the best agreement with objective accelerometer assessment compared to other subjective assessment techniques (Winzenberg et al. 2011).

Wearable fitness trackers and mobile technologies are increasingly being used in health care and public health practice (mHealth) for patient communication, monitoring, and education, and to facilitate adherence to chronic diseases management. There is potential for mHealth tools to better facilitate adherence to chronic disease management (Hamine et al. 2015) and these may include devices such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices (World Health Organization 2011). Wearable fitness trackers including smartphones have been shown to be sufficiently accurate for measurement of steps (Case et al. 2015; Evenson et al. 2015; Hekler et al. 2015) and also have the advantage of being able to measure sedentary behaviour (Sanders et al. 2016). The use of mHealth tools designed around the needs of particular populations could lead to greater levels of monitoring and tracking of important biometric information, primarily collected passively, coupled with real-time personalised feedback when needed and with automated transmission to a patient's health practitioner when desired (Steinhubl et al. 2013). Consumer-oriented wearable devices or smartphones have also been evaluated for their potential integration into healthcare settings and shown to be feasible tools for objectively assessing physical activity levels (Lobelo et al. 2018).

Considerations when deciding on a tool or method to use in clinical practice should be that it can: be implemented as part of a regular consult; performed quickly; not be a burden on patient or practitioner; provide useful information; and be carried out with limited resources

(Strath et al. 2013). It is suggested that objective measures such as heart rate monitoring, accelerometers and pedometers should be used because their small size, low participant burden and relatively low cost are appropriate and feasible for use in clinical practice settings (Trost et al. 2014; Winzenberg et al. 2011). Whilst many tools and methods are appropriate for use in research situations, they are impractical for use in clinical practice. Feasible, acceptable, and sustainable methods to assess physical activity in clinical practice are currently not well described (Stoutenberg et al. 2017) and there is a distinct lack of data on the actual use and efficacy of these tools and methods in clinical practice.

Brief advice

Brief advice is a strategy that could potentially be delivered in primary care and it has been shown to increase self-reported physical activity in the short term (Lamming et al. 2017). Brief advice may include verbal advice, discussion, negotiation or encouragement, with or without written or other support or follow-up. It can vary from basic advice to a more extended, individually focused discussion (The National Institute for Health and Care Excellence 2006). The World Health Organisation has called for action to develop and implement national standardised protocols on brief advice on physical activity in primary health (World Health Organization 2018). Moderate evidence from 15 studies suggests that there is an increase in the self-reported physical activity levels of those participants who received brief advice, or who were seen by primary care professionals trained to deliver brief advice (The National Institute for Health and Care Excellence 2006). It is acknowledged, however, that the physical activity levels of those participants who received brief advice could have been impacted by social-desirability bias due to the self-reported tools used to measure activity. Nonetheless, brief advice that is tailored to the patients and includes follow-up may be more effective in increasing patient activity levels (National Institute for Health and Care Excellence 2013). In addition, brief interventions promoting physical activity in primary care appear to be cost

effective (Pears et al. 2015), and are likely to be inexpensive compared with usual care (Vijay et al. 2016). However, there is limited evidence about the long term impact of brief advice and the factors that influence its effectiveness, feasibility and acceptability (Lamming et al. 2017).

Counselling and behaviour change

Behavioural change counselling or techniques are defined as one-on-one counselling that includes identifying barriers to physical activity, problem solving barriers to physical activity and setting physical activity goals. A review for the United States Preventive Task Force (Berg et al. 2002) claims there is considerable evidence to support physical activity counselling behavioural change techniques and recommends their use in clinical practice to increase physical activity levels. It suggests that medium to high-intensity physical activity counselling resulted in medium to large increases in self-reported physical activity behaviours. However, there is limited evidence for behaviour changes extending beyond twelve months (Lin et al. 2010).

A review of reviews found that effectiveness is associated with increased contact frequency and using a specific cluster of "self-regulatory" behaviour change techniques (e.g. goal-setting, self-monitoring) (Greaves et al. 2011). This is supported by more recent reviews that suggest better results may be obtained by strategies that include multiple behavioural change and motivational techniques, multiple sessions and those targeted to insufficiently active patients (Gagliardi et al. 2015; Sanchez et al. 2015).

Exercise prescription

In one systematic review (Sorensen et al. 2006), most studies reported moderate improvements in physical activity or physical fitness for six to 12 months following Exercise on

Prescription (EoP), even though there is a lack of high-quality studies evaluating EoP schemes in everyday use in general practice. In another review (Swinburn et al. 2003) focusing on older populations, some programs of written exercise prescriptions by general practitioners significantly increased physical activity levels over the medium-term. The authors suggest there are more challenging barriers to the widespread uptake of exercise prescription programs such as structural and economic constraints within general practice, as well as the competing promotion of prescribing pharmaceutical products.

Referral

It is recommended that those less qualified health professionals refer to other more qualified health professionals and exercise professionals for physical activity advice or counselling (Khan et al. 2011). Some patients, particularly those at risk, may need referral to an appropriate allied health professional, such as an accredited exercise physiologist or physiotherapist, sports and exercise physicians, or other appropriately trained allied health practitioners. Tulloch (Tulloch et al. 2006) argues that referral to allied health professionals such as physical activity counsellors results in a better long term (>6 months) improvement in physical activity behaviour. Little other evidence exists for the efficacy or outcomes of referral to another health professional for advice and counselling.

Exercise referral schemes that normally consist of referrals by healthcare professionals to a tailored program to increase physical activity or exercise, physical activity or exercise programs tailored to individuals, and initial assessment and monitoring throughout programmes, have only a small effect on increasing physical activity in sedentary people (Williams et al. 2007). This may have been due to poor rates of uptake and adherence to the exercise schemes. There is uncertainty surrounding the effectiveness of exercise referral schemes for increasing physical activity, fitness, or health indicators (Pavey et al. 2011). Exercise referral is reported to

improve physical activity levels in the short term but its longer term effect is unclear (Orrow et al. 2012). NICE reports (The National Institute for Health and Care Excellence 2014) that the evidence suggests that these exercise referral schemes have only a marginal added effect relative to other ways of increasing physical activity.

In Australia, less than 10% are referred to other health care practitioners for interventions (Amoroso et al. 2009; Harris, M et al. 2012) and there are a number of reported barriers to health professional referral of patients for physical activity advice or counselling. Patients referred for advice or to a program need to be willing pay for the service, unless they are part of Chronic Disease General Practice Management Plans or Team Care Arrangements (Australian Government Department of Human Services 2019). Perceived patient resistance to out of pocket costs is often cited as a barrier to referral, with many General Practitioners (GPs) believing their patients would not take up referrals if they had to pay (Ampt, A et al. 2009). Other perceived influencing factors preventing referral are a lack of knowledge regarding the role of the exercise physiologist and some GP beliefs that they should be predominantly responsible for managing the health condition (Ampt, A et al. 2009). One Australian example, that incorporates referral, The Get Healthy Information and Coaching Service®, showed improvements in the proportion of participants undertaking recommended levels of physical activity from baseline to 12-months (increase of 5.2%), however the improvements made at end of the coaching program were not maintained at the 6-month follow up (O'Hara et al. 2013).

Follow-up

The NICE guidelines (The National Institute for Health and Care Excellence 2006) recommend that primary care practitioners follow up on advice with patients at appropriate intervals over

a three to six-month period. A number of reviews (Eakin, Elizabeth G et al. 2005; Foster et al. 2005; Gagliardi et al. 2015; Pinto et al. 2001) suggest that some form of routine follow-up including assessment and support through repeat visits, telephone calls, or other contact be considered to improve physical activity promotion outcomes.

Written education and motivational material

Four reviews have found strong evidence for the short-term effectiveness of the use of written or motivational material (Eakin et al. 2000; Hillsdon et al. 2005; Petrella et al. 2002; Stensel 2009).

Tailoring

It is recommended (The National Institute for Health and Care Excellence 2006) that primary care practitioners tailor their advice to patients' needs including their motivations and goals, current level of activity and ability, circumstances, preferences for and barriers to being physically active, and health status. For practitioners who work directly with clients, it is recommended that an individualised prescription (dosage) that takes into consideration the unique characteristics and needs of the client be provided (Warburton et al. 2016a). Studies in which interventions were tailored to participants' characteristics enhanced success rates (Eakin et al. 2000). There is also strong evidence to support the need for individualised exercise prescriptions for patients, including varied recommendations for improving health-related physical fitness and functional status (Warburton et al. 2016b). Additionally, tailored exercise prescription strategies give promise for long-term increases in physical activity behaviour and physical fitness (Muller-Riemenschneider et al. 2008). Interventions tailored to people's needs have been found to encourage people to walk more (Ogilvie et al. 2007). Furthermore, populations with chronic disease, which predominantly consist of older

individuals, require tailored physical activity recommendations according to their disease status (Agency for Healthcare Research and Quality, 2002; Centers for Disease Control and Prevention, 2007). For example, due to the challenges related to blood glucose management that vary with diabetes type, activity type, and presence of diabetes-related complications, physical activity and exercise recommendations should be tailored to meet the specific needs of each individual (Colberg et al. 2016).

Monitoring

The use of a pedometer is associated with significant increases in physical activity and significant decreases in body mass index and blood pressure in the short term. Whether these changes are sustained over the long term is undetermined (Bravata et al. 2007). New technologies such as accelerometry show promise for future surveillance of physical activity (Hallal et al. 2012). However, it is not clear that data collected is related to significant health benefits and furthermore there is a failure to measure some important sources of human energy expenditure (Shephard et al. 2012).

5A's Framework

5As is an accepted framework for organising the assessment and management of behavioural risk factors in primary healthcare, and has been used for increasing physical activity levels (Dosh et al. 2005; Pinto et al. 2005). This framework involves: (1) Assessment of the patient's current level of physical activity and functional ability; (2) Advising the patient of the benefits of physical activity including personalising the potential benefits, as well as providing guidance on the appropriate amount and type of physical activity; (3) Agreeing with the patient on a physical activity goal, what barriers they anticipate to accomplishing this goal, and ask what are the specific goals for the type, intensity, duration, and frequency of physical activity; (4)

Assisting the patient in developing specific strategies to overcome barriers and a specific graduated action plan and (5) Arranging for follow-up assessment, support, and problem solving. A review of the literature of the '5As' model of behavior change (Glasgow et al. 2006) found that assistance in problem solving and arranging follow-up support is especially important to produce meaningful and lasting behaviour change.

The roles of different individual health professions

Each health profession has a unique contribution to make to the practice of clinical prevention and population health (Zenzano et al. 2011). However, the roles and responsibilities of many of the health professions in promoting physical activity remain uncertain. To date most of the research has primarily focused on the role of the primary care physician, with a growing amount of studies looking at the role of other primary healthcare professionals including nurses, physiotherapists, dieticians, psychologists and pharmacists. A number of authors have acknowledged and given support to non-medical health professionals' involvement in the promotion of physical activity (Estabrooks et al. 2003; Tulloch et al. 2006; VanWormer et al. 2009; Vuori 2013; Vuori et al. 2013; Weiler et al. 2012). It is suggested that nurses and allied health professionals such as physiotherapists, occupational therapists, dietitians, pharmacists and exercise physiologists are in an ideal position to promote physical activity, although there is limited evidence of their physical activity promotion behaviours and knowledge (Freene et al. 2017b). Many of the health professions may possess an unrealised and undeveloped potential for promoting physical activity.

Health professionals' perception of their own role is also an important factor in enacting that role. There is moderate evidence from a review (The National Institute for Health and Care Excellence 2006) of six studies (two qualitative and four quantitative) that suggest that

practitioner willingness to discuss and/or prescribe physical activity was influenced by whether they perceived this activity to be within their remit or role. Those health professionals who saw physical activity promotion as being within their role were more likely to provide brief physical activity advice. In a recent survey (Freene et al. 2017b), Australian nurses and allied health professionals overwhelmingly agreed that both discussing the benefits of a physically active lifestyle with patients and suggesting to them ways to increase daily physical activity is part of the health professionals' role.

Physical activity promotion may also be a responsibility and a duty rather than just a role. It is argued that as physical activity promotion is embedded within a number of ever-increasing clinical guidelines with strong supporting medical and cost-effectiveness data, its delivery is a duty of care and a medicolegal responsibility for all healthcare practitioners (Weiler et al. 2012).

The role of primary care physicians in promoting physical activity is firmly established and has been widely reported (Lawlor et al. 1999; Ribeiro et al. 2007; van der Ploeg et al. 2007). Large sections of the general population will consult with a primary care physician at least once a year and consider him/her to be a credible source of information (Booth et al. 1997). Given the inherent trust that patients have in their primary care physicians, they continue to play a central role in delivering effective physical activity interventions (AuYoung et al. 2016). Guidelines recommend that primary care physicians regularly assess and manage behavioural risk factors such as physical inactivity (The Royal Australian College of General Practitioners 2018). However, practitioner and patient reports of delivery of activity promotion by their primary care physicians are suboptimal (Buffart et al. 2009; Kennedy et al. 2003; VanWormer et al. 2009; Wee et al. 1999). Primary care physicians report facing many barriers to engaging in physical activity promotion including a lack of time, limited patient receptiveness, lack of

remuneration, and limited behavior counseling skills (Eakin, Elizabeth G et al. 2005; Wechsler et al. 1996).

The physical activity promotion roles of a number of non-medical health professionals have been studied in some detail including nurses (Happell et al. 2011; McDowell et al. 1997; Richards 2015; Richards et al. 2016), physiotherapists (Kunstler et al. 2018a; Kunstler et al. 2018b; Kunstler et al. 2018c; Lowe et al. 2018; Verhagen et al. 2009; World Confederation for Physical Therapy 2007), dieticians (McKenna et al. 2004; Stitzel 2006), psychologists (Burks et al. 1989; Burton et al. 2010; McEntee et al. 1996; Phongsavan et al. 2007; Wendt 2005), pharmacists (Brown et al. 2012; Joyce et al. 2007; Kotecki et al. 2000; Laliberté et al. 2012) and exercise physiologists (Gillam 2015).

A recent cross-sectional online survey was carried out to investigate current promotion and knowledge of physical activity among Australian nurses and allied health professionals (occupational therapists, physiotherapists, exercise physiologists, dieticians and pharmacists) (Freene et al. 2017b). All disciplines agreed that providing physical activity advice was part of their role. Most of the participants were confident in giving physical activity advice, felt they had the skills and believed integrating brief counselling into regular consultations was feasible. Physiotherapists and exercise physiologists were more confident in giving physical activity advice to patients and nurses were more likely to report a lack of time as a barrier. However, little is known about health professional roles and behaviours outside these professions.

An Australian report (Harris, M et al. 2012) acknowledges that further research is required to identify which allied health professionals ought to be involved in preventive care for different populations, and how the organisation of the practice can best support the roles of practice nurses and allied health professionals. With the increasing demands that medical doctors face

in general practice, and the barriers that prevent them from promoting physical activity, there is reason to further investigate the practices and roles throughout the non-medical health professions. An increased involvement of the non-medical health professions in physical activity promotion has the potential to extend the reach to a larger proportion of the community. Furthermore, adults without a primary health care professional receive less counselling for physical activity and therefore, other health care providers might need to be encouraged to provide exercise counselling (Hootman 2018).

All health professions have the potential to promote physical activity, particularly those professions with access to patients that would benefit from being more active, those professions that already have skills and knowledge in physical activity assessment, musculoskeletal conditions and exercise therapy and those who are able to follow up and monitor patients' progress. There is a lack of information regarding physical activity promotion in a number of other non-medical health professions. Podiatry is one profession in which there is a dearth of knowledge.

Factors that influence health professionals to promote physical activity

A number of systematic reviews (Bock et al. 2012; Eakin, Elizabeth G et al. 2005; Hebert et al. 2012; Huijg et al. 2015b; Lobelo et al. 2016) have examined the factors that influence various health professionals to promote physical activity. Most of these reviews have primarily focused on the practitioner's practice behaviours, knowledge, attitudes and beliefs.

Eakin's et al. review (Eakin, Elizabeth G et al. 2005) of the barriers to delivering physical activity counseling included eight studies, five of which investigated medical practitioners, two both medical and nurse practitioners, and one nurses only. Common barriers were: a lack of time (respondents' reports ranged between 40.6% and 92.5%), limited patient receptiveness including a lack of patient interest or willingness to adhere to physical activity advice (seven studies, range 7.4% to 55%), lack of remuneration or financial incentive (six studies, range:11.6% to 46.7%), and barriers grouped under perceived lack of practitioner knowledge, skill, or training relevant to physical activity counselling (five studies, range: 12% to 64.9%). Other barriers included considering other issues to be more important to address with patients (four studies, range: 6.9% to 58.3%), believing that counseling could be successful (three studies, range: 10.3% to 35%) and not believing that exercise has been established as an important risk factor (three studies, range: 6.8% to 12.9%).

Another review (Hebert et al. 2012) included 19 studies of primary care providers' attitudes and perceptions pertaining to physical activity counselling. Most healthcare professionals believed physical activity counselling is important and that they have a role in promoting physical activity among their patients. However, providers are uncertain about the effectiveness of counselling, feel uncomfortable providing detailed advice about physical activity, and again cite lack of time, training and reimbursement as barriers. Providers report that they were more likely to counsel their patients about physical activity if they were active themselves, or if they felt their patients' medical condition would benefit from a lifestyle change.

The largest review (Huijg et al. 2015b), with 59 articles, reviewed the factors influencing primary health professionals' physical activity promotion practices. The common factors thought to positively influence physical activity promotion were primary healthcare

professionals' knowledge, skills and positive attitudes toward physical activity promotion, resources, and strategies to reinforce primary care professionals' physical activity promotion practices. Factors thought to negatively influence physical activity promotion were lack of time and formal education, primary healthcare professionals' competing priorities, and their perception of patients' lack of motivation to be physical active. This review separately reported on the factors that were investigated for their association with physical activity promotion. Perceived influencing factors that had a significant positive relationship with physical activity promotion were: the full development of a physical activity promotion protocol, physical activity promotion's positive effects on patients' physical activity levels, support for the physical activity promotion from primary healthcare organisations and professionals and from staff within the organisation, the use of other preventive interventions within the organisation, and longer consultation time. Furthermore, physical activity promotion was most often conducted in patients of higher socioeconomic status, with poorer physical health, and with conditions linked to physical inactivity. In addition, physical activity was most often promoted by primary healthcare professionals with a positive attitude toward the physical activity promotion's effectiveness, positive intentions and habits regarding physical activity promotion.

The majority of the studies in these reviews focused on general medical practitioners within primary care, with only limited attention given to studies including allied health professions and those outside the primary care setting. Nonetheless, these studies are important, giving insights into current practice behaviours and receptiveness of each profession, along with revealing the feasibility and practicality of physical activity promotion within each professional setting. It is not known, however, whether the physical activity promotion behaviors observed in these studies, or their influencing factors, are similar in nature or different to those that may be observed among podiatrists.

Health promotion in podiatry

A podiatrist's role involves tertiary and secondary prevention and has traditionally focused on the management of existing pain and dysfunction. With increased attention to the importance of preventive healthcare generally, there has also been development in health promotion research within the podiatry field and an increased interest in primary prevention.

Conventionally, health promotion research in podiatry has been related to core podiatry roles. In a 2011 United Kingdom report on allied health professions and health promotion (Needle et al. 2011) studies of podiatrists represented 8% of all allied health professional studies. The main conditions targeted in these studies are diabetic foot complications (38%), self-management (38%) and falls prevention (25%). One study that diverts from core roles involved the implementation and evaluation of integrating a stop smoking advice initiative into routine podiatry services (Gray 2007). This study showed that stop smoking health improvement advice is feasible and could be introduced into the majority of podiatry consultations with minimal financial outlay and without comprehensive clinic delays.

One of the few studies to assess any sort of health promotion behaviour in podiatry concluded that podiatrists are in favour of health promotion but suggested their potential as a health promoter is untapped (O'Boyle et al. 2000). Factors which podiatrists felt restricted their ability to promote health included: time available (97%), access to training (61%) and access to information (61%). The factors that podiatrists felt could enhance their ability to promote health were identified as: training (80%), articles in professional journals (58%) and management support (56%). The motivating factors for integrating health promotion in practice were felt to be personal interest in the subject (76%) and a professional duty (49%).

There is a paucity of information regarding physical activity promotion within podiatry with only one opinion piece (Moore 2009) found in a search of the literature.

Physical activity promotion in podiatry

Clinical practice guidelines for promoting physical activity in the podiatry setting do not currently exist and to our knowledge no podiatric professional association has provided a position statement affirming the role of the podiatrist. Furthermore, little is known about the extent to which podiatrists incorporate physical activity assessment and promotion into their clinical practice, and the factors associated with it. Given their fundamental role, patient contact and interaction, and access to many patients who would benefit from increasing their physical activity levels, podiatrists are well placed to promote physical activity. It is possible that the podiatry setting provides an unexploited and undeveloped opportunity for physical activity promotion and that podiatrists could play an important public health role.

The podiatrists' role

To become a podiatrist in Australia, you must complete a Bachelor of Podiatry and podiatrists must be registered with the Podiatry Board of Australia and meet the Board's registration standards to practise in Australia (Podiatry Board Australia 2019). Podiatrists specialise in the prevention, diagnosis, treatment and rehabilitation of disorders, medical and surgical conditions of the feet and the lower limbs. Core podiatry treatment involving the treatment of the nails, corns and calluses and also giving footwear and foot health advice has been shown to sustain or improve foot health and pain in 75% of patients (Farndon et al. 2009). Regular care for core podiatry foot problems can give pain relief and maintain or improve mobility. Without this type of care there can be significant deterioration in foot health and in the

general health of certain patients over a period of time (Farndon et al. 2012). The process of core podiatry incorporates the theoretical, clinical and communicative skills of the podiatrist to reduce pain and improve or preserve foot health and mobility (Farndon 2006). Reducing pain and improving foot function is an important first step in enabling patients to become more active or maintain activity. Podiatrists have a fundamental and important role in facilitating patient mobility which provides an appropriate forum for the promotion of physical activity.

Podiatrist-Patient contact and interaction

Podiatrists have a unique patient-practitioner relationship where there is significant opportunity for health promotion during routine clinical care combined with regular and ongoing contact with patients (O'Boyle et al. 2000). Routine clinical podiatry care regularly involves the use of manual tasks in the treatment of many foot conditions which present to the podiatrist. These tasks may allow for the opportunity to counsel patients on their physical activity behaviours. Many of these conditions often require regular six to eight-week consultations over a lifetime that may offer the chance for ongoing physical activity counselling. As in common with nurses, because of their frequent contact with patients and ability to develop trusting, therapeutic relationships, this can help motivate patients to make health behaviour changes such as increasing physical activity (Richards 2015).

Podiatrists see a significant proportion of the population. In Australia, the 2014–2015 National Health Survey (Australian Bureau of Statistics 2015a) estimated that 892,000 persons had consulted a podiatrist in the last twelve months, and another population-based study (Menz et al. 2008) indicated that approximately 9.5% of the general population had consulted a podiatrist in the past twelve months.

Podiatrists have access to many patients, both in public and private settings, who could benefit from physical activity promotion. Physical activity counselling by podiatrists can be targeted toward either primary prevention and/or the reduction of secondary complications of chronic conditions within the practice of routine podiatric care delivery.

Podiatry patients who may benefit from increasing physical activity levels

A podiatrist's patient load includes a high percentage of patients with chronic disease, many of whom may benefit from physical activity advice. An Australian government initiative, the Enhanced Primary Care (EPC) plan, allows people with chronic conditions or a terminal illness to access health professional services to assist with the management of their condition with the benefits of a Medicare rebate. Between 2004 and 2008 a total of 1,338,044 EPC services were provided by Australian podiatrists, second only to physiotherapy (1,388,460) and accounting for 34% of all EPC consultations provided by allied health professionals (Menz 2009). In Australia patients who access podiatry treatment were more likely to be female, aged over 45 years, obese, and have major chronic medical conditions (osteoporosis, osteoarthritis, diabetes, cardiovascular disease and high blood pressure) (Menz 2009; Menz et al. 2008).

Podiatrists play an important part in the identification and management of patients with diabetes. Diabetic sufferers require screening to identify those at risk of foot ulceration, as well as education, prescription footwear and intensive podiatric care (Singh et al. 2005). An audit of diabetic patients from a primary care trust in the United Kingdom (Nihat et al. 2006) showed that, of the 59% of patients classified as being at moderate risk and 7% at high risk of developing foot complications, many benefit from podiatry care. It concluded that podiatrists are able to assess risk and also educate patients on reducing risk. Strong evidence exists for the prevention or delay of type 2 diabetes through lifestyle changes (Diabetes Prevention

Program Research Group 2002; Lindström et al. 2006). Components of these programs may be adaptable for use in clinical settings (Burnet et al. 2006). It is recommended that all individuals with diabetes or prediabetes receive physical activity advice (American Diabetes Association 2015). Promoting weight-bearing activity did not lead to significant increases in foot ulcers. Weight-bearing activity can be considered following adequate assessment and counselling of patients with diabetes and peripheral neuropathy (LeMaster et al. 2008).

Podiatrists treat and manage a high percentage of older patients. Podiatry care consists of mostly palliative treatments, on a regular basis, often for life, and demand is expected to grow as the elderly population increases (Moore et al. 2003). The elderly have difficulty cutting their toenails and the most common foot problems are corns or calluses, abnormal nails, hallux valgus and other toe abnormalities (White et al. 1989). Utilisation of podiatry services is higher in those aged over 65 years and accounted for 75% of consultations (Menz 2009). The mean age of podiatry patients in one study was 72.9 years (Farndon et al. 2009). A 2014-2015 Australian National Health Survey (Australian Bureau of Statistics 2015a) found that 15.6% of over 75 year-olds had consulted a podiatrist in the previous twelve months, the highest percentage of all non-medical health professionals. Many of these older patients may benefit from physical activity promotion.

It is recommended that older people seek podiatry intervention for falls prevention (Gillespie et al. 2012; O'Rourke 2007; Spink et al. 2008; Waldron et al. 2012). Foot pain, reduced range of motion, toe weakness, toe deformity and footwear related issues have each been shown to be independent risk factors for falling (Koepsell et al. 2004; Menz et al. 2006; Mickle et al. 2009). Podiatrists have an important role to play in reducing the risk of falls by means of general foot care health, patient education, health promotion, rehabilitation and mobility (Frankowski 2010). This provides opportunity for physical activity promotion to be delivered that can help

reduce the incidence of falls whilst providing numerous other benefits for health and well-being. It is important to recognise that podiatrists may not necessarily be trained in the assessment of balance and postural control, meaning that the assessment of falls, and prescription of exercise to address falls risk may be better placed with others or as part of a multi-disciplinary program.

It is likely that individuals with cancer undergoing chemotherapy treatment will consult a podiatrist. Proper foot care may be extremely important to prevent the onset or development of lesions, pain, infections, and/or deformities throughout the chemotherapy process (Palomo-López et al. 2017). These patients will often seek the help of a podiatrist, giving the opportunity to promote the benefits of physical activity in the treatment of cancer. Podiatrists as members of a multidisciplinary team are well placed to promote physical activity and recommend that people with cancer adhere to exercise guidelines. Furthermore, they can follow best practice and include referral to an accredited exercise physiologist or physiotherapist with experience in cancer care (Cormie et al. 2018).

There is a paucity of information regarding physical activity promotion in the podiatry setting. Given the importance of physical activity and the opportunity for promoting it in podiatry, a better understanding of podiatrists' physical activity promotion behaviours is warranted. There is a clear need to develop knowledge of how and why podiatrists do or do not engage in physical activity promotion.

Aims

The objective of this thesis was to explore and understand the factors that influence podiatrists' physical activity promotion behaviours. The specific aims were:

1. to identify the current status of physical activity promotion in podiatry in Australia;
2. to identify Australian podiatrists' attitudes and beliefs regarding physical activity promotion;
3. to identify patients' experiences and perceptions of podiatrists' physical activity promotion;
4. to identify the factors that influence podiatrists to engage in promotion physical activity.

Chapter 2 - Methodology

This chapter discusses the methodological approach in response to the aims stated in Chapter 1.

Pragmatic paradigm

A pragmatic paradigm was chosen to explore and understand the factors that influence podiatrists in physical activity promotion in a clinical setting. With the pragmatic paradigm, "the focus is of the consequences of the research, on the primary importance of the question asked rather than the methods, and the use of multiple methods of data collection to inform the problem under study. Thus, it is pluralistic and orientated toward what works and real world-world practice" (Creswell et al. 2017).

Research methods

The epistemology of clinical practice is complex and multifactorial and therefore the use of a combination of research methods is appropriate to obtain a comprehensive understanding of behaviour. Both quantitative and qualitative research techniques are helpful for gaining a more complete understanding of phenomena (Johnson et al. 2004; Newman et al. 1998). The use of mixed methods seeks to produce information that is broad in scope but also has depth by providing insight into the views and experiences of study participants. This approach is appropriate to answer the aims of this study.

Greene, Caracelli, and Graham (Greene et al. 1989) outline five broad purposes of mixed methodological studies: (1) *Triangulation* seeks convergence, correspondence and corroboration of results from different methods; (2) *Complementarity* seeks elaboration,

enhancement, illustration and clarification of the results from one method with results from the other method; (3) *Development* seeks the results from one method to help inform the other method; (4) *Initiation* seeks the discovery of paradox and contradictions, new perspectives of frameworks, the recasting of questions or results from one method with questions or results from the other method; and (5) *Expansion* seeks to extend the breadth and range of inquiry by using different methods for different inquiry components.

The strengths of mixed research apart from the specific strengths of quantitative and qualitative research have been highlighted (Johnson et al. 2004). These include: adding insights and understanding that might be missed when only a single method is used; using an additional method to overcome weaknesses in another method by using both in a research study; providing stronger evidence for a conclusion through convergence and corroboration of findings; answering a broader and more complete range of research questions; can be used to increase the generalisability of the results; words, pictures, and narrative can be used to add meaning to numbers; numbers can be used to add precision to words, pictures, and narrative; and qualitative and quantitative research used together produce more complete knowledge necessary to inform theory and practice.

The assessment of the role of health care professionals is thought to be better served by a more balanced approach that includes the strengths of both qualitative and quantitative methods (Watts et al. 2001). Furthermore, a mixed methods approach has been found to be helpful in formulating future actions and developing healthcare clinical practice (Cochrane et al. 2007).

This thesis primarily uses a descriptive method in the reporting and interpretation of information regarding the current status and factors that influence podiatrists' physical activity

promotion practices. The major purpose of descriptive research is description of the state of affairs as it exists at present (Kothari 2004). The main characteristic of this method is that researchers have no control over the variables and can only report what has happened or what is happening (Kothari 2004). Descriptive research is a purposive process of data gathering, analysing, classifying and tabulating the prevailing conditions, practices, beliefs, trends, cause and effect relationships, and then adequate and accurate interpretation about such data with or without the aid of statistical treatment.

Integration of mixed methods

Integration of methods occurs at different stages of this thesis. Firstly, an exploratory sequential design (Fetters et al. 2013; O'Cathain et al. 2010; Onwuegbuzie et al. 2010) was used where the researcher collected and analysed qualitative data and then used these findings to inform the development and refinement of subsequent quantitative data collection (Chapter 4). More specifically, items for inclusion in later quantitative surveys were built upon previously collected qualitative interview data that identified constructs or language used by research participants.

In addition, findings from a systematic review of the literature are also employed in the development of subsequent quantitative data collection (Chapters 5 and 6). This includes identification of items and constructs commonly used to study other heath professionals' physical activity promotion behaviours, beliefs and attitudes.

Integration of the methods also occurs at the interpretation level. The qualitative and quantitative findings were reported in different chapters, however, a contiguous approach that involves the presentation of findings and integration through narrative within the discussion was used.

Use of existing research

In the absence of existing research into physical activity promotion or other similar health promotion studies in podiatry, this thesis builds on previous research that involves other healthcare professionals and their clinical behaviour. The thesis draws on existing research in related fields. There is an ever-increasing amount of research regarding healthcare professional delivered physical activity promotion being published. Most of this research focuses on the current status of clinical practice and the factors that influence health practitioners to engage in promotion. It is logical that these studies are particularly relevant to the podiatry profession. The methodology used in this thesis aligns with similar study outcomes, target groups, and clinical contexts. This approach provides a base for a methodology to study the phenomena that are appropriate to justify the objectives of this thesis.

Behavioural theories

This thesis uses existing theories to help explain the physical activity promotion behaviour of podiatrists. Benefits have been shown from the use of theories in the design, development, implementation and evaluation of healthcare research (Eccles et al. 2005; Grol et al. 2007; Nigg et al. 2002). Furthermore, the importance of the use of theoretical models and frameworks in understanding and changing clinicians' behaviour has been supported by many studies (Cochrane et al. 2007; Grimshaw et al. 2002; Perkins et al. 2007; Walker et al. 2003). In particular, researchers have recommended using theory as the framework in identifying barriers and facilitators facing primary care providers engaging in physical activity counselling (Behrens et al. 2014).

Many factors can influence clinical practice of healthcare professionals (Fleuren et al. 2004; Grol et al. 2004). These include factors that are related to the individual professional and their

patients, economic, social, political and organisational influences, and characteristics of the innovation or intervention. The focus of this thesis is on the factors that are related to the individual podiatrist and his/her patients.

A socio-cognitive theory was considered the most appropriate to explore the determinants of podiatrist behaviours. A socio-cognitive theory helps to explain how health professionals think and make decisions about their daily work (Grol et al. 2007). In this thesis, elements of the Theory of Planned Behaviour (TPB) (Azjen 1991) help guide identification and measurement of the beliefs, attitudes and intention for engagement in the promotion of physical activity by podiatrists and their patients. The TPB (Figure 2.1) states that any given behaviour is influenced by the individual's intentions (or motivation) to perform the specific behaviour and that these intentions are determined largely by attitudes toward the behaviour, perceived social norms, and perceived control related to the behaviour (Azjen 1991). The TPB has been well used to identify and predict healthcare practitioners' behavioural intentions (Millstein 1996) and along with its predecessor, the Theory of Reasoned Action, was reported to be the theory most often used as a reference in studies that aimed to predict healthcare professionals' intentions and behaviours (Godin et al. 2008). This theory has been used in research, including the identification of influences affecting whether general practitioners choose to screen and manage lifestyle risk factors (Ampt, AJ et al. 2009) and has also tested the theory's ability to predict states of change for physical activity promotion by mental health care professionals (Faulkner et al. 2001). The efficacy of the TPB theory has been reviewed in meta-analyses of studies using this approach (Armitage et al. 2001; Godin et al. 1996) and it was found that the TPB constructs accounted for significant variances in intention and behaviour. The TPB cognitive constructs and the relationships between them have been validated for behaviours relating to health, especially physical activity (Hagger et al. 2002). The intent was to use this theoretical model as a basis for a framework and to further refine and

conceptualise the various factors into a format that is grounded in the views of participants. This theory-based approach allows for a better understanding of clinical behaviour of podiatrists (and patients) and better accommodates measurement of the individual components that influence podiatrists' clinical practice.

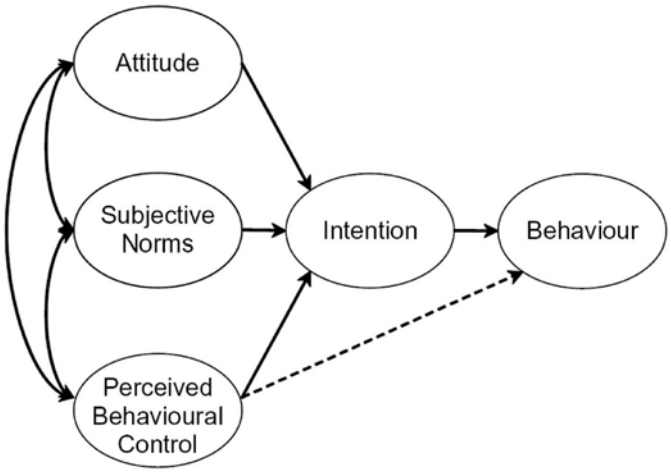

Figure 2-1 Theory of Planned Behaviour

Source: Azjen, I. 1991. 'The theory of planned behavior', Organizational Behavior and Human Decision Processes, 50: 179 - 211.

Implications for further research, intervention strategies and clinical practice

While it is important to identify current clinical practice, establish the need for improvement and understand how or which multiple factors pose barriers to that clinical practice, it is also important to use that information to improve practice. Considerations should be given to the translation, diffusion and dissemination of the information and the facilitation of optimal clinical practice (Cochrane et al. 2007; Eakin et al. 2004). The intent is to design and develop studies, and present data and findings that are practical, transferable and directed towards target audiences. Therefore, the information produced must be able to: 1) create a broad

awareness amongst podiatrists about physical activity promotion in podiatry; 2) help policy makers and stakeholders to make decisions regarding the best approach for developing strategies for progressing physical activity promotion in podiatry; and 3) provide researchers with a base for further study.

Methodology overview

Each of the following four chapters is allocated to the description of a study. The relationships between the studies are shown in Figure 2.2. Studies 1 and 2 (Chapters 3 and 4, respectively) are inductive studies that provide a fundamental understanding of the field of study. Studies 3 and 4 (Chapters 5 and 6, respectively) provide data on the current status of and factors related to physical activity promotion in podiatry.

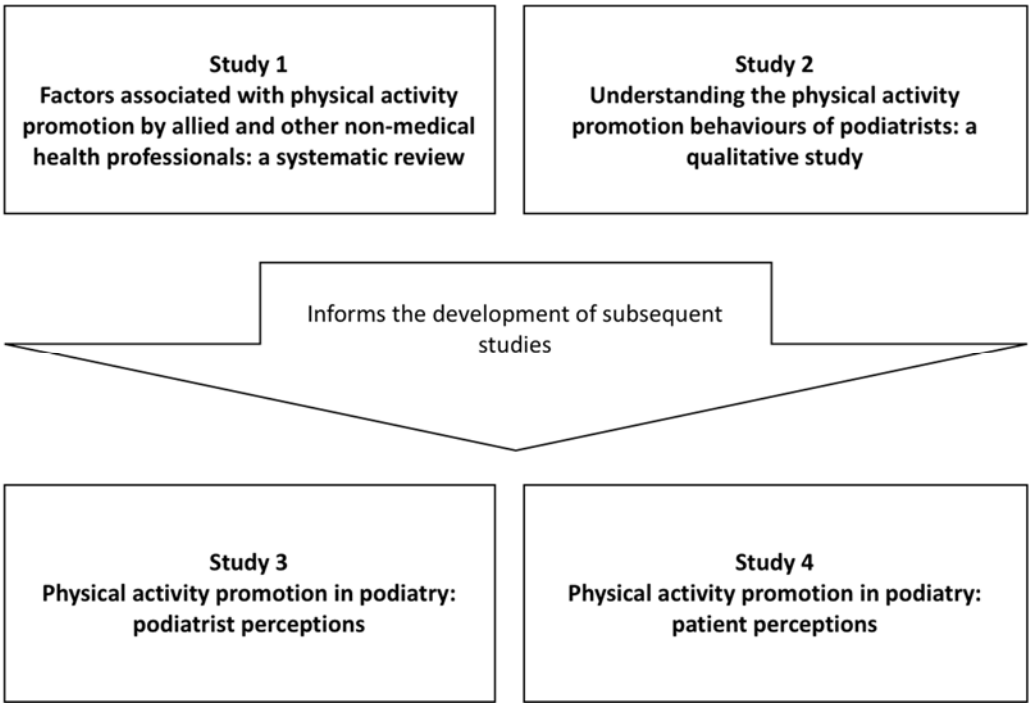

Figure 2-2 Integration of individual studies

Study 1: Factors associated with physical activity promotion by allied and other non-medical health professionals: A systematic review (Chapter 3)

The aim of this study was to determine the factors associated with non-medical health professionals' engagement in physical activity promotion. In the absence of existing podiatry-specific data, and with a need for a better understanding of the behaviours of podiatrists, the identification of factors associated with the behaviour of other non-medical healthcare professionals was considered appropriate. An exploration of the literature brings a broader understanding of the factors that may influence a health professional to engage in promoting physical activity. Additionally, it allows an examination of the methods used to identify these factors and to take these methods into account when designing data collection instruments in subsequent studies. Conceptual traditions used to examine problems in previous research will help in the design of methodology, data collection instruments and analysis of studies 3 and 4 (Chapters 5 and 6).

Study 2: Understanding the physical activity promotion behaviours of podiatrists: A qualitative study (Chapter 4)

This was a qualitative study to help understand the physical activity promotion behaviours of podiatrists. Currently, little is known about the extent to which podiatrists incorporate physical activity assessment and promotion into their clinical practice and the factors associated with it have not yet been identified. Therefore, as an important first step to understand the behaviour, a study was undertaken to explore the factors that facilitate or impede podiatrists' physical activity promotion. The aims of this study were to identify podiatrists' physical activity assessment and promotion practices, the barriers and enablers facing them and their salient beliefs about and attitudes towards physical activity promotion and their role in that process. This study involved semi-structured interviews with podiatrists using a qualitative

methodological approach. These interviews were designed within a behavioural theoretical framework to identify the beliefs, attitudes, knowledge and practice behaviours. The choice of semi-structured interviews as a method is appropriate because they are well suited to an exploratory study focused on eliciting beliefs, attitudes, knowledge and experiences, and are appropriate to answer the aims. Semi-structured interviews are a flexible and dynamic form of interviewing that provide an opportunity to obtain more detail from the podiatrist about their beliefs, attitudes, knowledge and experiences of physical activity promotion. This method elicited podiatrists' views and accounts and has the additional benefit of uncovering issues or concerns that had not been anticipated or considered by the researchers (Smith et al. 2003). The knowledge gained from this study is used in the development, design, analysis and evaluation of further studies.

Study 3: Physical activity promotion in podiatry: A quantitative study (Chapter 5)

Whilst the qualitative study provided insights into roles and an understanding of practice, there is little known about the extent to which Australian podiatrists incorporate physical activity promotion in their clinical practice and to what degree particular characteristics or factors influence them in engaging in physical activity promotion. This means that there is little evidence at present upon which to guide interventions to promote physical activity in the podiatry setting. Therefore, a quantitative study was undertaken to describe the status of podiatrists' physical activity promotion behaviours, the perceived facilitators, barriers and role beliefs, and to identify the factors related to physical activity promotion.

A questionnaire was developed to gather information on podiatrists' physical activity promotion and the potential influencing factors on this behaviour. The questionnaire was based on salient issues specific to podiatrists identified in the qualitative work (Study 2), the

findings of the systematic review of factors associated with physical activity promotion by allied and other non-medical healthcare professionals (Study 1), as well as other relevant literature. Individual items assessed the podiatrists' characteristics, self-reported physical activity assessment and promotion and their beliefs and attitudes regarding physical activity promotion.

The identification and subsequent measurement of the barriers and enablers that are associated with healthcare professionals' clinical behaviour is instrumental in providing a better understanding of the determinants of a health professional's behavioural change (Grimshaw et al. 2002). This in turn can lead to the implementation of effective change strategies (Grol et al. 2004). An understanding of the factors associated with a podiatrist's physical activity promotion may be achieved through identification of his/her beliefs, attitudes, knowledge and practice behaviour in regard to physical activity promotion.

This study provides an understanding of the factors that are associated with Australian podiatrists' physical activity promotion. This study builds on existing knowledge, however, it proposes a theoretical conceptual framework unique to the podiatry setting that may be used in the development and evaluation of further studies. This study informs the development of intervention and dissemination strategies that may assist podiatrists to promote physical activity during routine clinical practice.

Study 4: Patient perceptions of podiatrist delivered physical activity promotion: A quantitative study (Chapter 6)

There is no information available regarding podiatry patients' perceptions of podiatrists' physical activity promotion. The aim of this study was to identify patients' experiences and perceptions of podiatrists' physical activity promotion behaviours. A questionnaire was

developed to measure patient perceptions of podiatrists' physical activity promotion delivered by podiatrists, including the factors that have potential to influence the podiatrist to engage in physical activity promotion, as well as factors that may influence patient receptivity to physical activity promotion. The questionnaire was informed by the three previous studies, as well as other literature focusing on other healthcare professionals and their patients. This study provides an understanding of the physical activity promotion interaction from podiatry patients' point of view. It helps to identify which podiatry patients receive physical activity promotion, which patients are receptive to physical activity promotion, and patient perceptions of the podiatrists' role in physical activity promotion. Such knowledge helps to evaluate the need for improvement and gives guidance to enhance communication and expectations between patient and provider. Information gained would be of interest when targeting strategies such as better informed interventions aimed at increasing promotion and improving the success of delivery.

Chapter 3 - Factors associated with physical activity promotion in allied and other non-medical health professionals: A systematic review

Crisford, P, Winzenberg, T, Venn, A, Schultz, M, Aitken, D & Cleland, V 2018, 'Factors associated with physical activity promotion by allied and other non-medical health professionals: A systematic review', Patient Education and Counseling, vol. 101, no. 10, pp. 1775-1785.

Introduction

Physical inactivity continues to be a leading cause of the burden of disease and mortality globally (World Health Organisation 2009). Yet, one-third of adults do not reach the levels of physical activity recommended in public health guidelines (Hallal et al. 2012). Considering the magnitude of the problem of inactivity, optimising management of this important risk factor must be a priority concern for all health professionals.

National and international organisations encourage health professionals to promote physical activity to their patients (National Heart Foundation of Australia 2009; Patrick et al. 2009) and there are many opportunities within the health care sector to assess and counsel patients on physical activity (Patrick et al. 2009). Many patients attribute responsibility for promoting increased physical activity to health professionals and are keen for their support (Leijon et al. 2010).

The World Health Organisation advises that health professionals screen patients for levels of physical activity at every primary care consultation and also provide brief, structured

counselling for insufficiently active patients, particularly those with diseases or conditions such as diabetes, cardiovascular disease, some cancers, or arthritis (Global Advocacy Council for Physical Activity 2010). It is recommended that the advice be delivered by a broad range of primary care professionals, not only general practitioners (Scottish Physical Activity Review Group 2008; The National Physical Activity Plan Alliance 2016). However, there is reluctance by many health professionals to engage in physical activity promotion with their patients (VanWormer et al. 2009; Vuori et al. 2013).

Studies of physical activity promotion by healthcare professionals to date have predominantly focused on medical doctors rather than on allied and other non-medical health professions (Bock et al. 2012; Eakin, Elizabeth G et al. 2005; Hebert et al. 2012). One systematic review (Huijg et al. 2015b) that included a wide range of health professionals was confined to the primary care setting but, many allied and other non-medical health professions, including nurses, work in settings outside of primary care and their physical activity promotion behaviours may not have been captured by previous systematic reviews.

Identifying the correlates of physical activity promotion is critical to the development and implementation of strategies to engage, encourage and ultimately increase physical activity promotion practices by health professionals. Therefore, the aim of this systematic review was to determine what factors are associated with non-medical health professionals' engagement in physical activity promotion.

Methods

We performed a systematic search of five English language electronic databases (*PubMed, Embase, CINAHL, Psychinfo, Web of Science)* for papers published between database inception date and September 2016 (Search details given in Appendix 3.1). Additional studies were sought from reference lists of included studies.

Our protocol (available upon request) stipulated that studies would be included in the review if they met the following criteria; 1) participants were practising health professionals (excluding medical doctors) 2) physical activity promotion practice measures were reported and 3) a test of association between an influencing factor or an intervention and a physical activity promotion practice measure was performed. Studies were excluded: 1) if they were not in English, 2) where data collected from health professionals were not separately reported from medical doctors and (3) if they are non–peer-reviewed articles or conference abstracts.

Two review authors (PC, MS) independently assessed studies against the inclusion and exclusion criteria. Two review authors (DA, PC) independently extracted the following data: publication details (author, date published, title, journal, country), study aim, method (including design, piloting, sampling, recruitment, data collection, setting, data analysis, ethics, conflict of interests, funding and descriptions of participants, potential factor and physical activity promotion practices) and results (response rate, non-response details, participant characteristics, and results of tests of association between potential factors and physical activity promotion practices).

Potential factors that were investigated in the studies were grouped into themes (DA, PC), previously used by Francke et.al (Francke et al. 2008), consisting of categories including factors

related to the health professional, patient, environment and implementation. The substantial heterogeneity of the study methods, population groups, settings, exposure and outcome measures, units of measurement and analytic techniques made meta-analysis inappropriate. Therefore, a narrative synthesis was conducted using thematic analysis.

Study quality was assessed using a standardized abstraction form and a qualitative procedure developed by Zaza and colleagues (Zaza et al. 2000). Study procedures and results were collected and specific threats to the validity of the study were assessed across six categories (intervention and study descriptions, sampling, measurement, analysis, interpretation of results and other execution issues). Authors (DA, PC) assessed study quality independently, provided a qualitative overview of main limitations of the included studies and agreed on rating by consensus.

Results

Study characteristics

The search resulted in identification of 8169 studies (Figure 3.1) of which 30 studies involving 7734 participants were included.

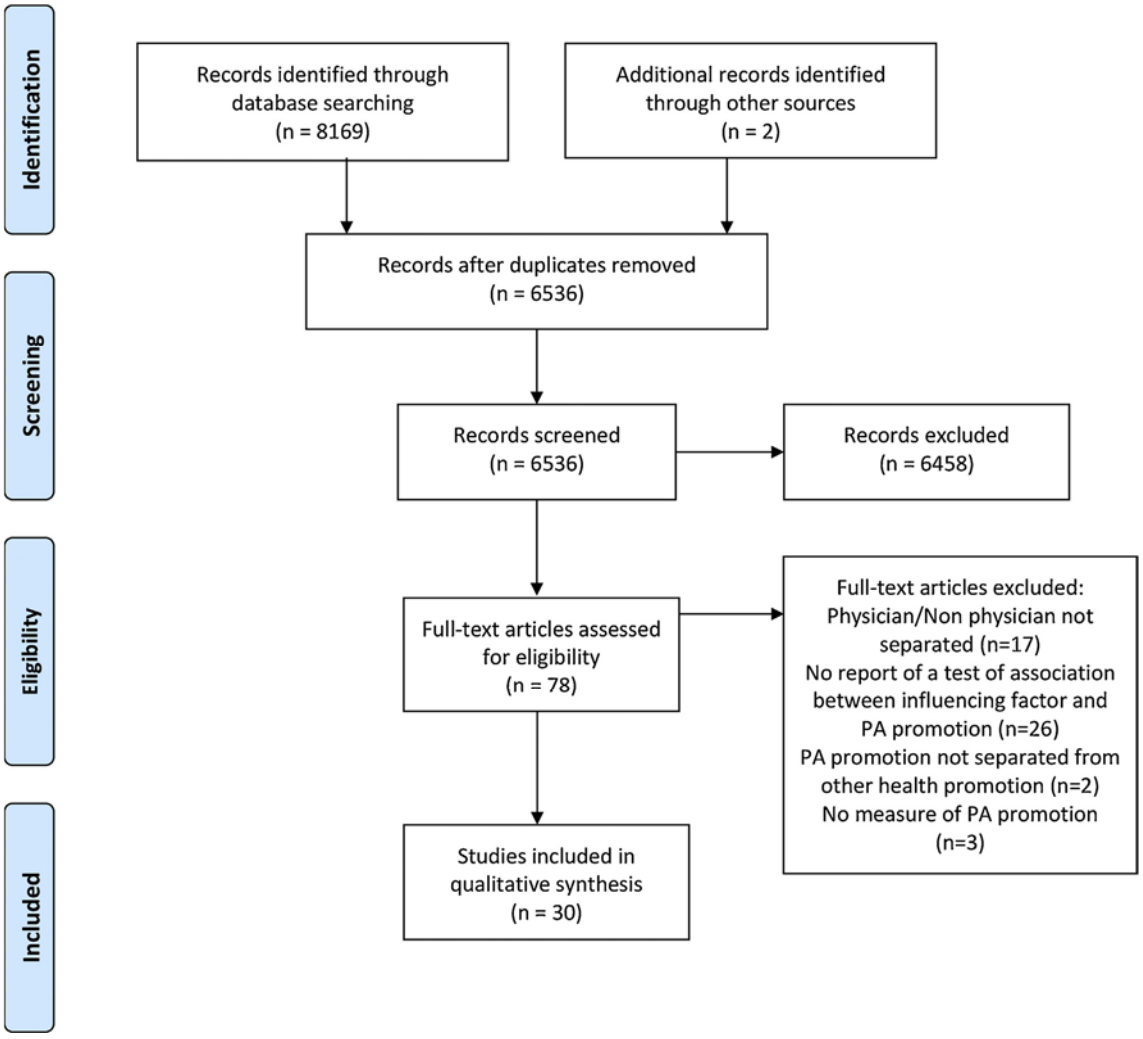

Figure 3-1 Review process flow chart showing the number of papers identified, included and excluded at each stage of the review process.

Legend: *PA* Physical Activity

Detailed characteristics of included studies are given in Appendix 3.2 including study publication details, participants, settings, study design, physical activity promotion measures, potential factor association data and quality assessment limitations. In brief, health professions represented in the studies consisted of dieticians (n=3), dental hygienists (n=1), health care support workers (n=1), nurses (n=9), practice nurses (n=2), nurse practitioners (n=4), nurse midwives (n=1), oncology nurses (n=2), psychiatric nurses (n=1), occupational therapists (n=1), practice assistants (n=1), physiotherapists (n=9),

psychologists/psychotherapists (n=4), mixed allied health practitioners (n=2). The studies originated from nine different countries, ranged in size from 34 to 623 participants and in publication year from 1990 to 2016. Of the studies in which participants' ages were reported (n=21), the mean age was 41.6 years (range: 32.5 - 51.8 years). The proportion of female participants was considerably higher than males in all but five studies (Abaraogu et al. 2015; Aweto et al. 2013; McElwaine et al. 2014; McEntee et al. 1996; Mouton et al. 2014). Two studies were longitudinal(Faulkner et al. 2001; Sassen et al. 2011), one was a non-randomized controlled study (McElwaine et al. 2014), and the rest were cross-sectional. All used a self-report survey to collect data which was delivered by mail, email or telephone. Four studies used existing theory (Pender's Health Promotion Theory (Esposito et al. 2011), the Theoretical Domains Framework (Huijg et al. 2015a), and the Theory of Planned Behaviour (Faulkner et al. 2001; Sassen et al. 2011) as a framework to study the factors that influence PA promotion practices. Studies either duplicated (Abaraogu et al. 2015; Aweto et al. 2013) or adapted pre-existing data collection instruments (Bakhshi et al. 2015; Esposito et al. 2011; Faulkner et al. 2001; Frantz et al. 2013; Karvinen et al. 2015; Karvinen et al. 2012; Lamarche et al. 2013; Laws et al. 2008; McElwaine et al. 2014; McKenna et al. 1998; Robbins 2004; Shirley et al. 2010; Stanton et al. 2015) or developed their own tool (Burns et al. 2000; Burton et al. 2010; Dauenhauer et al. 2006; Florindo et al. 2013; Huijg et al. 2015a; Hurkmans et al. 2011; Johnson et al. 2007; McDowell et al. 1997; McEntee et al. 1996; McKenna et al. 2004; Mouton et al. 2014; Mullen et al. 1990; Rea et al. 2004; Sassen et al. 2011; Wendt 2005). Studies included participants working both in and outside of primary care settings (see Appendix 3.2 for details on settings).

Physical activity promotion measures

Table 3.1 summarises the physical activity promotion practices and measures used as outcomes in each study. Many different forms of physical activity promotion practice and measures were used as outcome measures within the methods of the studies.

Table 3-1 Physical activity promotion practices and measures of included studies

Physical activity promotion practices	Study
Ask about activity	(Burton et al. 2010; Laws et al. 2008; McElwaine et al. 2014; Wendt 2005)
Assess readiness to change	(Laws et al. 2008)
Promote PA	(Bakhshi et al. 2015; Faulkner et al. 2001; Florindo et al. 2013; McDowell et al. 1997; McKenna et al. 1998)
PA advice	(Abaraogu et al. 2015; Burton et al. 2010; Laws et al. 2008; McElwaine et al. 2014; McKenna et al. 2004)
Recommend exercise or activity	(Burton et al. 2010; Esposito et al. 2011)
Provide PA recommendations	(Karvinen et al. 2012)
Advise patients to take regular physically activity	(Hurkmans et al. 2011)
Advise about risks and benefits of PA	(Wendt 2005)
Assist with increasing cardiovascular fitness	(Rea et al. 2004)
Discuss activity or exercise	(Burton et al. 2010; Laws et al. 2008; McEntee et al. 1996)
Discuss lifestyle behaviours	(Burton et al. 2010)
Encourage patients to become physically active	(Aweto et al. 2013; Sassen et al. 2011; Shirley et al. 2010)
Encourage behaviour change	(Wendt 2005)
PA counselling of patients	(Burton et al. 2010; Karvinen et al. 2015; Mullen et al. 1990; Robbins 2004)
Routine counselling to meet PA guidelines	(Burns et al. 2000)
Prescribe PA/Exercise prescription	(Dauenhauer et al. 2006; Lamarche et al. 2013; Stanton et al. 2015)

Physical activity promotion practices	Study
Provide PA written materials	(Abaraogu et al. 2015; McDowell et al. 1997)
Referral to a health or exercise professional	(Abaraogu et al. 2015; Johnson et al. 2007; Laws et al. 2008; McElwaine et al. 2014; McKenna et al. 2004)
Follow-up of PA progress	(Laws et al. 2008; McDowell et al. 1997; McElwaine et al. 2014)
Completeness of delivery (intake, training program, evaluation, maintenance and contact with referring professional)	(Huijg et al. 2015a)
Counselling strategies related to PA/active living	(Johnson et al. 2007)
Self-reported PA promotion practices	(Mouton et al. 2014)

Physical activity promotion measures	Study
Frequency of PA promotion	(Abaraogu et al. 2015; Burton et al. 2010; Dauenhauer et al. 2006; Huijg et al. 2015a; Hurkmans et al. 2011; Johnson et al. 2007; Lamarche et al. 2013; McDowell et al. 1997; Stanton et al. 2015)
Proportion of patients provided PA promotion	(Aweto et al. 2013; Laws et al. 2008; Sassen et al. 2011; Wendt 2005)
Number of patients provided PA promotion	(Shirley et al. 2010)
Percentage of patients provided PA promotion	(Karvinen et al. 2015; Karvinen et al. 2012; Lamarche et al. 2013; Robbins 2004)
Time spent discussing PA	(Karvinen et al. 2015; Laws et al. 2008; McKenna et al. 2004)
Percentage of time assisting with increasing PA	(Rea et al. 2004)
Response to a hypothetical patient vignette	(McEntee et al. 1996)
Physical Activity Exit Interview	(Frantz et al. 2013)
PA promotion Stages of Change	(Bakhshi et al. 2015; Faulkner et al. 2001; Florindo et al. 2013; McDowell et al. 1997; McKenna et al. 1998)
Combined self-reported PA promotion score	(Mouton et al. 2014)

Legend: *PA* Physical Activity

Factors associated with physical activity promotion

Tables 3.2-3.5 summarise the findings of the studies with regards to associations between health-professional-related factors (Table 3.2), patient-related factors (Table 3.3), implementation-strategies-related factors (Table 3.4) and environment-related factors (Table 3.5) and physical activity promotion

Table 3-2 Summary of health professional related factors

Potential influencing factor	Significant association with PA promotion	No significant association
Attitudes and beliefs to PA and PA promotion		
Attitude towards PA promotion		
Attitude towards PA promotion (+)	Mental health professional(Faulkner et al. 2001)	
	Nurse/Physiotherapist(Sassen et al. 2011)	
Positive emotions towards PA intervention (+)	Physiotherapist(Huijg et al. 2015a)	
Negative emotions towards PA intervention (-)		Physiotherapist(Huijg et al. 2015a)
Optimism (+)		Physiotherapist(Huijg et al. 2015a)
Belief in PA promotion role		
Acceptability of giving PA advice and counselling (+)	Psychologist(Burton et al. 2010)	
Social/professional role and identity (+)	Physiotherapist(Huijg et al. 2015a)	
Role perception (+)		Physiotherapist(Aweto et al. 2013)
Primary care practitioners should be proactive in prescribing exercise (+)		Nurse/Practice assistant(Dauenhauer et al. 2006)
Suggesting ways to increase daily PA is part of role (+)		Physiotherapist(Shirley et al. 2010)
Beliefs about the benefits of PA		
Belief in benefits of PA (+)	Nurse(Esposito et al. 2011)	Physiotherapist(Aweto et al. 2013)
	Midwife/Dietician(Mullen et al. 1990)	Physiotherapist(Shirley et al. 2010)
	Physiotherapist(Mouton et al. 2014)	Dental Hygienists(Mullen et al. 1990)
Ability to do daily tasks and to help cope during treatment (+)	Oncology nurse(Karvinen et al. 2012)	
Beneficial to psychological functioning (+)	Psychologist(McEntee et al. 1996)	
Benefit for psychological well-being or complex conditions (+)	Psychologist(Burton et al. 2010)	

Potential influencing factor	Significant association with PA promotion	No significant association
PA was not related to psychological functioning (-)	Psychologist(Wendt 2005)	
PA counselling helps client's behaviour (+)	Psychologist(Wendt 2005)	
All on and post treatment PA benefits (+)	Oncology nurse(Karvinen et al. 2012)	
Benefit for physical conditions (+)		Psychologist(Burton et al. 2010)
Benefits for chronic disease (+)		Nurse/Practice assistant(Dauenhauer et al. 2006)
Benefits for individuals of any age (+)		Nurse/Practice assistant(Dauenhauer et al. 2006)
Not appropriate for most older adults (-)		Nurse/Practice assistant(Dauenhauer et al. 2006)
Importance of exercise (+)		Nurse/Practice assistant(Dauenhauer et al. 2006)
Beliefs about importance of PA promotion		
Importance (+)	Nurse practitioner(Lamarche et al. 2013)	
Priority (+)	Allied health/Nurse(Laws et al. 2008)	
	Physiotherapist(Huijg et al. 2015a)	
Lack of interest in promoting PA (-)		Physiotherapist(Shirley et al. 2010), Physiotherapist(Aweto et al. 2013)
Importance of PA programs in PHC (+)		Nurse(Florindo et al. 2013)
Beliefs about efficacy of PA promotion		
Adherence expectation (+)	Midwife/Dietician(Mullen et al. 1990)	Dental Hygienists(Mullen et al. 1990)
Would not change the patient's behaviour (-)	Physiotherapist(Shirley et al. 2010)	Physiotherapist(Aweto et al. 2013)

Potential influencing factor	Significant association with PA promotion	No significant association
Outcome expectation (+)		Physiotherapist(Rea et al. 2004)
Lack of success (-)		Practice nurse(McDowell et al. 1997)
Beliefs about feasibility of PA promotion		
Feasibility of brief PAP integrated into regular consultations, one-on-one and group PAP consultations	Physiotherapist(Shirley et al. 2010)	
Feasibility of distribution of PAP resources (+)		Physiotherapist(Shirley et al. 2010)
Feasible/priority that PA programs offered in health care unit (+)		Nurse(Florindo et al. 2013)
Beliefs about consequences of PA promotion		
Combined attitude, outcome expectancies and reinforcement (+)	Physiotherapist(Huijg et al. 2015a)	
Norms (social influence)		
Subjective norm (+)	Mental Health Professional(Faulkner et al. 2001)	
Descriptive, subjective norm and social support (+)	Physiotherapist(Huijg et al. 2015a)	
Descriptive and subjective norm (+)	Physiotherapist(Sassen et al. 2011)	
Moral norm (+)		Physiotherapist(Sassen et al. 2011)
Self-efficacy/Confidence		
Confidence (+)	Allied health/Nurse(Laws et al. 2008)	
Confidence to provide general PA advice and activity Counselling (+)	Psychologist(Burton et al. 2010)	
Confidence in suggesting PA programs (+)	Physiotherapist(Shirley et al. 2010)	
Feels prepared (+)	Nurse(Florindo et al. 2013)	
Confidence to assess and counsel (+)		Nurse practitioner(Burns et al. 2000)
Confidence in providing PA advice (+)		Physiotherapist(Aweto et al. 2013)

Potential influencing factor	Significant association with PA promotion	No significant association
Competence (+)	Nurse practitioners(Lamarche et al. 2013)	
Self-efficacy (+)	Midwive/Dietician/Dental Hygienists(Mullen et al. 1990)	
	Physiotherapist(Rea et al. 2004)	
Beliefs about capabilities (+)	Physiotherapist(Huijg et al. 2015a)	
Unsure what kind of PA to recommend (-)	Oncology nurse(Karvinen et al. 2012)	
Perceived behavioural control (+)		Mental Health Professional(Faulkner et al. 2001)
		Nurse/Physiotherapist(Sassen et al. 2011)
Knowledge and Skills		
Perceived knowledge (+)	Physiotherapist(Huijg et al. 2015a)	
Perceived skills (+)	Physiotherapist(Huijg et al. 2015a)	
Perceived knowledge to counsel (+)	Nurse practitioner(Burns et al. 2000)	
Perceived knowledge of PA assessment and follow up of PA (+)	Allied health/Nurse(Laws et al. 2008)	
Knowledge of definition of PA (+)	Physiotherapist(Mouton et al. 2014)	
Knowledge of PA message. Perceived lack of counselling skills (+)		Physiotherapist(Aweto et al. 2013)
Knowledge of PA message. Awareness of PA guidelines.		Physiotherapist(Shirley et al. 2010)
Perceived lack of counselling skills (+)		
Knowledge to assess (+)		Nurse practitioner(Burns et al. 2000)
Knowledge of moderate activity (+)		Psychologist(Burton et al. 2010)
Knowledge on the recommendations of PA, moderate or vigorous-intensity PA (+)		Nurse(Florindo et al. 2013)

Potential influencing factor	Significant association with PA promotion	No significant association
Knowledge of risk factors) (+)		Nurse(McDowell et al. 1997)
The dimensions of PA, physical manifestation of effective PA, PA recommendations for adults or children (+)		Physiotherapist(Mouton et al. 2014)
Training		
Training in the past 5 years (+)	Practice nurse(McDowell et al. 1997)	
Training in exercise counselling (+)	Psychologist(Wendt 2005)	
PA counselling training (+)	Oncology nurse(Karvinen et al. 2015)	
Education other than NP program (+)	Nurse practitioner(Burns et al. 2000)	
Behaviour change training and referral to GP (+)	Dietician(McKenna et al. 2004)	
PA-training with referring patients to a GP or physiotherapist (-)	Dietician(McKenna et al. 2004)	
Training on changing PA behaviour and providing written material (+)	Physiotherapist(Abaraogu et al. 2015)	
Attendance at workshop more referral to PA professionals (+)	Dietician(Johnson et al. 2007)	
Attendance at workshop and use of PA promotion strategies (+)		Dietician(Johnson et al. 2007)
Education about PA in NP program (+)		Nurse practitioner(Burns et al. 2000)
Postgraduate instruction or attendance at workshop on PA (+) advice/counselling (+)		Psychologist(Burton et al. 2010)
Intention		
Intention to promote PA (+)	Mental health professional(Faulkner et al. 2001) Nurse/Physiotherapist(Sassen et al. 2011) Physiotherapist(Huijg et al. 2015a)	

Potential influencing factor	Significant association with PA promotion	No significant association
Behavioural characteristics		
Past behaviour (+)	Mental Health Professional(Faulkner et al. 2001)	
Habit (+)	Physiotherapist(Sassen et al. 2011)	
Action and Coping planning (+)	Physiotherapist(Huijg et al. 2015a)	
Memory and Automaticity (+)	Physiotherapist(Huijg et al. 2015a)	
Health professional's characteristics		
Health Professional's demographics		
Working 1-5 years (+)	Physiotherapist(Aweto et al. 2013)	
>6 years clinical experience (+)	Physiotherapist(Abaraogu et al. 2015)	
Age <35 years, male (+)	Physiotherapist(Frantz et al. 2013)	
Private practice (+)	Physiotherapist(Burton et al. 2010)	
More years in practice (+)	Physiotherapist(Wendt 2005)	Psychologist(Burton et al. 2010)
Age (+)	Oncology nurse(Karvinen et al. 2012)	Physiotherapist(Abaraogu et al. 2015), Physiotherapist(Huijg et al. 2015a) Nurse/Physiotherapist(Hurkmans et al. 2011) Psychologist(Burton et al. 2010) Practice nurse(McDowell et al. 1997)
Female (+)	Physiotherapist(Abaraogu et al. 2015)	Nurse/Physiotherapist (Hurkmans et al. 2011) Physiotherapist(Huijg et al. 2015a) Psychologist(Burton et al. 2010)
20–29 years, no long-term health problems, Caucasian, staff nurses (+)	Nurse(Bakhshi et al. 2015)	

Potential influencing factor	Significant association with PA promotion	No significant association
Qualifications. Practice location. Clinical specialization. Practice Context (+)		Physiotherapist(Burton et al. 2010)
Years as a PN, Practice Demographics, Number of GPs or PNs, Total patient list (+)		Practice nurse(McDowell et al. 1997)
Practice demographics, Practice experience (+)		Physiotherapist(Huijg et al. 2015a)
Health professional's area of interest		
General health and wellbeing client issues. Being a generalist. Mental health, personal development trauma/harm or addictions client issues (+)	Psychologist(Burton et al. 2010)	
Relationship or work/community client issues (+)		Psychologist(Burton et al. 2010)
PA Level		
PA level (+)	Nurse practitioner(Lamarche et al. 2013)	Physiotherapist(Frantz et al. 2013) Nurse/Practice assistant(Dauenhauer et al. 2006) Oncology nurse(Karvinen et al. 2012) Nurse practitioner(Robbins 2004) Nurse practitioner(Burns et al. 2000)
Relative PA levels (+)	Physiotherapist(Aweto et al. 2013)	Physiotherapist(Shirley et al. 2010)
Regular exercise (+)	Psychologist(Burton et al. 2010)	
Health-Promoting Lifestyles Profile-II (+)	Nurse(Esposito et al. 2011)	
Stage of change for own PA (+)	Practice nurse(McDowell et al. 1997)	

Exercising therapists (+)	Psychologist (McEntee et al. 1996)	
Potential influencing factor	**Significant association with PA promotion**	**No significant association**
Regular personal exercise (+)	Practice nurse(McKenna et al. 1998)	
Meeting current PA recommendation (+)	Nurse practitioner(Burns et al. 2000)	
SQUASH Questionnaire (+)	Physiotherapist(Hurkmans et al. 2011)	
Personal PA behaviour (+)		Dietician(McKenna et al. 2004)
IPAQ- SF Questionnaire (+)		Nurse(Stanton et al. 2015)
Moderate to vigorous PA (+)		Oncology nurse(Karvinen et al. 2015)
Being a role model (+)		Physiotherapist(Shirley et al. 2010)
		Physiotherapist(Aweto et al. 2013)

Legend: *IPAQ- SF* The International Physical Activity Questionnaire - Short Form, *GP* General Practitioners, *GPAQ* General Practice Activity Questionnaire, *NP* Nurse Practitioners, *PA* Physical Activity, *PHC* Primary Health Care, *(+)* positive influence on PA promotion, *(-)* negative influence on PA promotion, *SQUASH* The Short Questionnaire to Assess Health

Health professional related factors

Attitudes and beliefs to physical activity and physical activity promotion

There were positive associations between positive attitudes to physical activity promotion and physical activity promotion practice in three studies (Faulkner et al. 2001; Huijg et al. 2015a; Sassen et al. 2011).

Five studies assessed the relationship of a health professional's belief in their role to promote physical activity with physical activity promotion practice. Despite physiotherapists (Aweto et al. 2013; Shirley et al. 2010), physician assistants and nurse practitioners (Dauenhauer et al. 2006) having positive role beliefs, this was not associated with physical activity promotion practices except in one study in physiotherapy (Huijg et al. 2015a). In contrast, psychologists' (Burton et al. 2010) higher acceptance of giving physical activity advice and counselling was related to increased physical activity promotion.

Ten studies examined twelve constructs relating to beliefs about the benefits of physical activity and physical activity promotion but results were inconsistent. Positive beliefs were positively associated with physical activity promotion amongst registered dieticians and nurse-midwives (Mullen et al. 1990), psychologists (Wendt 2005), nurses (Esposito et al. 2011) and physiotherapists (Mouton et al. 2014). Psychologists who believed that exercise was beneficial to psychological functioning were more likely to promote physical activity (McEntee et al. 1996; Wendt 2005). Oncology nurses' belief that physical activity could be beneficial for patients both during treatment and post-treatment was associated with providing physical activity recommendations, however, other beliefs about the benefits of physical activity were not (Karvinen et al. 2012). Other associations were not significant (Aweto et al. 2013; Burton et al. 2010; Dauenhauer et al. 2006; Mullen et al. 1990; Shirley et al. 2010).

Six studies assessed beliefs about the importance or priority of physical activity promotion. This was positively associated with physical activity prescribing by nurse practitioners (Lamarche et al. 2013), the time nurses and allied health professionals spent discussing physical activity (Laws et al. 2008) and whether physiotherapists implement physical activity promotion (Huijg et al. 2015a), but there were no associations in other studies (Aweto et al. 2013; Florindo et al. 2013; Shirley et al. 2010).

Physiotherapists' negative belief in the efficacy of physical activity promotion was associated with less physical activity promotion in one study (Shirley et al. 2010), but not in other studies (Aweto et al. 2013; Rea et al. 2004). Dieticians' and nurse-midwives' beliefs in patient adherence to physical activity counselling was related to their physical activity promotion but dental hygienists' beliefs were not (Mullen et al. 1990), nor were practice nurses (McKenna et al. 1998).

Physiotherapists' belief in the feasibility of integration of brief promotion was associated with providing physical activity counselling (Florindo et al. 2013).

The combined constructs of attitude, outcome expectancies and reinforcement were associated with physiotherapists' implementation of physical activity promotion (Huijg et al. 2015a).

Three studies examined the norms (the social influence of others) and their association with physical activity promotion. In one, subjective norms were associated with physical activity promotion of mental health care professionals (Faulkner et al. 2001); in another, subjective norms and descriptive norms were associated with the level of physical activity promotion delivered by physiotherapists, but moral norms were not (Sassen et al. 2011); and in another,

subjective norms, descriptive norms and social support were associated with physiotherapists' implementation of a physical activity intervention (Huijg et al. 2015a).

Self-efficacy was assessed in thirteen studies. Participants' confidence in providing physical activity promotion (Burton et al. 2010; Florindo et al. 2013; Laws et al. 2008; Shirley et al. 2010) and belief in their ability to deliver physical activity promotion to patients (Huijg et al. 2015a; Karvinen et al. 2012; Lamarche et al. 2013; Mullen et al. 1990; Rea et al. 2004) were associated with increased physical activity promotion. Some studies found no association between participants' confidence (Aweto et al. 2013; Burns et al. 2000) or participants' perceived control over physical activity promotion and physical activity promotion (Faulkner et al. 2001; Sassen et al. 2011).

Knowledge and Skills

Perceived knowledge and skills relating to physical activity promotion was associated with physical activity promotion among nurse practitioners (Burns et al. 2000), physiotherapists (Huijg et al. 2015a; Mouton et al. 2014), and various allied health professionals (Laws et al. 2008). However, no associations were found in other studies (Aweto et al. 2013; Burns et al. 2000; Burton et al. 2010; Florindo et al. 2013; McDowell et al. 1997; Mouton et al. 2014; Shirley et al. 2010).

Training

Past participation in physical activity promotion training or education was associated with increased levels of physical activity promotion in studies of practice nurses (McDowell et al. 1997), psychologists (Wendt 2005), oncology nurses (Karvinen et al. 2015) and of nurses receiving education outside of nurse practitioner programs (Burns et al. 2000). In one study of

dieticians (McKenna et al. 2004), behaviour change training was associated with increased referral to a general practitioner and exposure to physical activity promoting training was negatively associated with referring patients to a GP or physiotherapist (McKenna et al. 2004). Physiotherapists that received training strategies were more likely to regularly assess patient's physical activity and provide patients with written material on physical activity (Abaraogu et al. 2015). Attendance at a workshop was associated with dieticians being more likely to refer patients to physical activity professionals, but not associated with other physical activity promotion strategies (Johnson et al. 2007). Neither physical activity promotion training in a nurse practitioner program (Burns et al. 2000) nor psychologists' postgraduate training were associated with physical activity promotion (Burton et al. 2010).

Intention

Two longitudinal prospective studies showed associations between the intention to promote physical activity and physical activity promotion among mental health professionals and nurses (Faulkner et al. 2001) and physiotherapists (Sassen et al. 2011). In another study of physiotherapists, intention to promote physical activity was associated with a physical activity intervention (Huijg et al. 2015a).

Behavioural characteristics

Past behaviour was a predictor of mental healthcare professional's physical activity promotion current behaviour (Faulkner et al. 2001) and habit of promoting physical activity was a predictor of PA promotion amongst nurses and physiotherapists (Sassen et al. 2011). Physiotherapists having a plan regarding implementation of physical activity promotion and their memory and automaticity of delivering the physical activity promotion intervention were positively associated with physical activity promotion (Huijg et al. 2015a).

Health professionals' characteristics

Eleven studies compared participants' personal and practice demographics and their physical activity promotion (Abaraogu et al. 2015; Aweto et al. 2013; Bakhshi et al. 2015; Burton et al. 2010; Frantz et al. 2013; Huijg et al. 2015a; Hurkmans et al. 2011; Karvinen et al. 2015; Karvinen et al. 2012; McDowell et al. 1997; Wendt 2005). There were positive associations between various physical activity promotion measures and: being a physiotherapist with five or more years of working experience (Abaraogu et al. 2015; Aweto et al. 2013); being less than thirty-five years of age and being a male physiotherapist (Frantz et al. 2013); more years in practice (Wendt 2005) and being in private practice for psychologists(Burton et al. 2010); oncology nurse's ages (Karvinen et al. 2012); being a female physiotherapist (Abaraogu et al. 2015); nurses aged 20–29 years, with no long-term health problems, being Caucasian and currently working as a staff nurse (Bakhshi et al. 2015). No other significant associations were found.

Health professionals' personal physical activity behaviour

Health professionals' personal physical activity behaviour was assessed in seventeen studies with varying methods applied for measuring physical activity levels. Significant associations were identified between higher levels of health professionals' physical activity and physical activity promotion in eight studies (Aweto et al. 2013; Burton et al. 2010; Esposito et al. 2011; Hurkmans et al. 2011; Lamarche et al. 2013; McDowell et al. 1997; McEntee et al. 1996; McKenna et al. 1998) but there was no association with PA promotion in nine studies (Burns et al. 2000; Dauenhauer et al. 2006; Frantz et al. 2013; Karvinen et al. 2015; Karvinen et al. 2012; McKenna et al. 2004; Robbins 2004; Shirley et al. 2010; Stanton et al. 2015). Burns et al. (Burns et al. 2000) reported contradictory findings with an association between whether nurse practitioners met the current physical activity recommendation and physical activity promotion, but no association with their current activity level. Physiotherapists' belief that

they should be physically active to act as role models was not associated with physical activity promotion (Aweto et al. 2013; Shirley et al. 2010).

Patient-related factors

Eight studies assessed the relationship between patient-related factors and physical activity promotion with findings summarised in Table 3.3.

Table 3-3 Summary of patient related factors

Potential influencing factor	Significant association with PA promotion	No significant association
Perceived client acceptability (+)	Allied health/Nurse(Laws et al. 2008)	
Fewer sedentary clients (-)	Psychologist(Wendt 2005)	
Discussing exercise with male > female clients (+)	Psychologist(McEntee et al. 1996)	
Diabetic dominated caseload (+)	Dietician(McKenna et al. 2004)	
Client burden (+)	Psychologist(Burton et al. 2010)	
Perceived patient motivation and positivity towards PA intervention (+)	Physiotherapist(Huijg et al. 2015a)	
Patients not interested (-)		Oncology nurse (Karvinen et al. 2012)
Motivated/positive patients (+)	Physiotherapist(Huijg et al. 2015a)	
More patients who initiate PA discussion (+)	Psychologist(Wendt 2005)	

Legend: *PA* Physical Activity, *(+)* positive influence on PA promotion, *(-)* negative influence on PA promotion

Positive associations with physical activity promotion and perceived client acceptability amongst allied health professionals (Laws et al. 2008); psychologists with proportionately fewer sedentary clients (Wendt 2005); dieticians' caseload dominated by diabetic patients (McKenna et al. 2004); practice nurses' follow-up of new, established and targeted patients, as

well as perceived client acceptability (McDowell et al. 1997); physiotherapists' positive perceptions about patients' motivation and positivity towards physical activity promotion (Huijg et al. 2015a); male psychotherapists were more likely to discuss exercise with male than female clients (McEntee et al. 1996); patients motivated towards receiving physiotherapy delivered physical activity promotion intervention (Huijg et al. 2015a); psychologists having a greater proportion of clients who initiated discussion about exercise (Wendt 2005). Psychologists' perceptions of the burden on the client was negatively associated with physical activity promotion (Burton et al. 2010). The belief by oncology nurses that patients are not interested in physical activity promotion was not associated with physical activity promotion (Karvinen et al. 2012).

Implementation strategy-related factors

Findings of studies examining relationships between implementation strategy-related factors and physical activity PA promotion are summarised in Table 3.4.

Table 3-4 Summary of implementation strategy-related factors

Potential influencing factor	Significant association with PA promotion	No significant association
Intervention efficacy		
Multi-strategy practice change intervention and clinician assessment of PA at baseline and at follow-up (+)	Allied health/Nurse (McElwaine et al. 2014)	
Multi-strategy practice change intervention and clinician provision of brief advice, referral/follow-up regarding PA (+)		Allied health/Nurse (McElwaine et al. 2014)
Intervention characteristics		
Potential for tailoring, compatibility with daily practice, simplicity and time to deliver (+)	Physiotherapist(Huijg et al. 2015a)	
PA assessment		
Asking new patients about PA habits (+)	Psychologists(Wendt 2005)	
Asking established patients about PA habits. Recording patient information (+)	Practice nurse(McDowell et al. 1997)	
Carrying out a PA assessment (+)	Nurse(Florindo et al. 2013)	
Asking new patients or patients with chronic conditions about PA habits (+)		Practice nurse (McDowell et al. 1997)
Follow-up		
Follow-up of new, established and targeted patients (+)	Practice nurse(McDowell et al. 1997)	
Follow-up of new, established or targeted patients using phone (+)		Practice nurse (McDowell et al. 1997)

Legend: *PA* Physical Activity, *(+)* positive influence on PA promotion, *(-)* negative influence on PA promotion

Intervention efficacy

A multi-strategy practice change intervention was shown to increase client reported clinician assessment of physical activity at baseline and at follow-up, however had no effect on the provision of brief advice for physical activity or increasing client referral or follow-up (McElwaine et al. 2014).

Intervention characteristics

Positive beliefs towards characteristics of the intervention were associated with promotion of physical activity (Huijg et al. 2015a).

Physical activity assessment

Asking a patient about physical activity or carrying out a physical activity assessment were shown to be associated with physical activity promotion in three out of four studies: psychologists asking new patients about their exercise (Wendt 2005), practice nurses asking established patients about their exercise (McDowell et al. 1997) and nurses carrying out a physical activity assessment (Florindo et al. 2013). Practice nurses asking new patients was not associated (McDowell et al. 1997).

Follow-up

Practice nurses' follow-up of new, established and targeted patients was associated with their level of physical activity promotion but not if this follow up was by the phone (McDowell et al. 1997).

Environmental-related factors

Findings of studies examining relationships between environmental-related factors and physical activity promotion are summarised in Table 3.5.

Table 3-5 Summary of environmental-related factors

Potential influencing factor	Significant association with PA promotion	No significant association
Facilitators		
PA programs in health unit (+)	Nurse(Florindo et al. 2013)	
Handing pamphlets to targeted patients with chronic conditions (+)	Practice nurse(McDowell et al. 1997)	
Handing pamphlets to new or established patients (+)		Practice nurse(McDowell et al. 1997)
Organizational resources and support (+)	Physiotherapist(Huijg et al. 2015a)	
Sociopolitical context (+)	Physiotherapist(Huijg et al. 2015a)	
Barriers		
Barriers (-)	Physiotherapist(Sassen et al. 2011)	
Time		
Lack of time (-)	Physiotherapist(Shirley et al. 2010)	Practice nurse(McKenna et al. 1998) Practice nurse(McDowell et al. 1997) Nurse(Florindo et al. 2013)
Lack of time post treatment (-)	Oncology nurse(Karvinen et al. 2012)	
Lack of time during treatment (-)		Oncology nurse(Karvinen et al. 2012)
Insufficient consultation time (-)	Physiotherapist (Aweto et al. 2013)	
Duration of consult (+)	Practice nurse(McKenna et al. 1998)	

Potential influencing factor	Significant association with PA promotion	No significant association
Remuneration		
Lack of remuneration (-)		Physiotherapist(Aweto et al. 2013)
PA counselling not reimbursed (-)		Oncology nurse(Karvinen et al. 2012)
Lack of incentives (-)		Practice nurse(McDowell et al. 1997) Physiotherapist(Shirley et al. 2010) Practice nurse(McKenna et al. 1998)
Resources		
Lack of resources (-)		Practice nurse(McDowell et al. 1997) Practice nurse(McKenna et al. 1998)
Protocols		
Lack of protocols (-)	Practice nurse(McDowell et al. 1997)	Practice nurse(McKenna et al. 1998)
Facilities for PA		
Lack of places for PA (-)		Nurse(Florindo et al. 2013)

Legend: *PA* Physical Activity, *(+)* positive influence on PA promotion, *(-)* negative influence on PA promotion

Environmental-related factors shown to be associated with facilitating physical activity promotion include: physical activity programs present in the health unit (Florindo et al. 2013); physiotherapists' beliefs about organizational resources and support, behaviour regulation, as well as, beliefs about the sociopolitical context (for example, government or insurance company support) (Huijg et al. 2015a); practice nurses handing pamphlets to targeted patients with chronic conditions, but not with handing pamphlets to new or established patients (McDowell et al. 1997).

Six studies investigated lack of time as a barrier to physical activity promotion. Three, including nurses, all reported no effect of lack of time (Florindo et al. 2013; McDowell et al. 1997; McKenna et al. 1998). One study in oncology nurses (Karvinen et al. 2012) reported that lack of time was not associated with physical activity promotion behaviour during cancer treatment but was associated post-treatment. One of these studies also reported that longer consultation times (by 1.5 to 2 minutes) resulted in a higher likelihood of physical activity promotion (McKenna et al. 1998). Two studies of physiotherapists found those who reported that time was a barrier were less likely to promote physical activity (Aweto et al. 2013; Shirley et al. 2010).

Beliefs about the lack of incentives or remuneration as a barrier was assessed in five studies (Aweto et al. 2013; Karvinen et al. 2012; McDowell et al. 1997; McKenna et al. 1998; Shirley et al. 2010). None demonstrated an association with physical activity promotion.

Practice nurses' beliefs about the lack of resources were not associated with physical activity promotion (McDowell et al. 1997; McKenna et al. 1998). The lack of physical activity promotion protocols were associated with less physical activity promotion of practice nurses in one study (McDowell et al. 1997) but not in another (McKenna et al. 1998).

Practice nurses' beliefs about the lack of resources were not associated with physical activity promotion (McDowell et al. 1997; McKenna et al. 1998), nor were nurses' beliefs about the lack of facilities for patients (Florindo et al. 2013).

The lack of protocols were associated with less physical activity promotion of practice nurses in one study (McDowell et al. 1997) but not in another (McKenna et al. 1998).

Quality assessment

Most studies had limitations, most commonly lack of non-respondent information, limited discussion, limited citation or testing of the validity or reliability of both the physical activity promotion measures and potential correlates. However on occasion, internal consistency (Bakhshi et al. 2015; Burton et al. 2010; Dauenhauer et al. 2006; Esposito et al. 2011; Faulkner et al. 2001; Huijg et al. 2015a; Hurkmans et al. 2011), inter-rater reliability checks (Abaraogu et al. 2015; Burns et al. 2000; Mouton et al. 2014) or test-retest were used (Abaraogu et al. 2015; McKenna et al. 1998; Mullen et al. 1990; Stanton et al. 2015). Additionally, only a few studies reported carrying out multivariable testing of associations in the analysis of data.

Discussion

This systematic review identified a range of factors associated with physical activity promotion amongst a broad range of health professionals. Overall, the evidence was inconsistent for most factors except remuneration, which consistently showed no association with physical activity promotion practices. A lack of time also appears to be an inconsequential barrier to the health professionals' physical activity PA promotion. Nonetheless, there was sufficient evidence to identify potentially important factors across various professions that might be associated with higher levels of physical activity promotion, the majority being socio-cognitive factors, which are potentially modifiable such as greater beliefs in the benefits of physical activity, and perceived self-efficacy in physical activity promotion. The evidence also supports a potential effect of physical activity promotion training. Though associations with personal physical activity behaviour were commonly assessed, the results were inconsistent.

The lack of incentives or remuneration for physical activity promotion, often declared as a major barrier to medical doctors (Eakin, Elizabeth G et al. 2005; Hebert et al. 2012; Huijg et al.

2015b), was not associated with the health professionals' physical activity promotion. Consistent with this, Douglas et al. (Douglas, F. et al. 2006) reported that general practitioners regarded lack of remuneration as more of a barrier than practice nurses or hospital visitors. Non-medical health professionals may consider physical activity promotion as a normal part of their role that would not consider or require extra remuneration for that task. Thus, alterations to funding models may not be required as part of any strategy to improve physical activity promotion practices in non-medical health professionals.

Evidence that lack of time was a major barrier for the health professions in this review was limited. In contrast, medical doctors often cite a lack of time as one of the greatest barriers to physical activity promotion (Eakin, Elizabeth G et al. 2005; Hebert et al. 2012; Huijg et al. 2015b). General practitioners are far more likely than nurses to report a lack of time to spend on preventative medicine (Steptoe et al. 1999) and general practitioners consider a lack of time more of a barrier to physical activity promotion than practice nurses (Douglas, F. et al. 2006; McKenna et al. 1998) or health visitors (Douglas, F. et al. 2006). Practice nurses may communicate better with patients because they have more time to do so compared to general practitioners (Dugdill et al. 2005). The dynamics of allied health professionals' and nurses' consults tend to differ from medical doctors in length, format and regularity. These differences may allow for more opportunity, making it more feasible for physical activity assessment and promotion by those health professions.

Furthermore, particular health professions may be more suited to providing physical activity promotion. For example, it is argued that physiotherapists and exercise physiologists have more expertise in exercise assessment and prescription (Franklin et al. 2009; Verhagen et al. 2009). In addition, a Swedish study revealed that physiotherapists, occupational therapists, nurses, and dieticians all issued relatively more physical activity prescriptions than physicians

(Leijon et al. 2008). It is also thought that community and primary care nurses are very well positioned to provide physical activity promotion given their contact with the community and a role that continues to evolve to integrate health promotion and chronic disease management. High rates of physical activity promotion have been reported amongst practice nurses of around 80-90% (Douglas, F. et al. 2006; McDowell et al. 1997), nurses are more likely to engage in physical activity promotion than general practitioners (Douglas, F. et al. 2006; Puig Ribera et al. 2005), and nurses may have stronger interpersonal communications with the patient (Dugdill et al. 2005). Practice nurses also have more favourable attitudes to the effects of lifestyle counselling for physical inactivity than doctors (Steptoe et al. 1999).

There is evidence that particular health professions may promote physical activity more effectively. Adherence rates of participants, to a 14-week intervention, were shown to be higher for those referred by cardiac rehabilitation nurses(57%) and practice nurses(45%) compared to participants referred by a general practitioner (32%) (Dugdill et al. 2005). The review by Tullloch et al (Tulloch et al. 2006) showed that combined-provider or allied health professional only physical activity interventions produce better results over time than physicians alone. They suggest this may be a consequence of the length, intensity and content of the physical activity counselling, as well as the qualities of the provider. Further investigation of the physical activity promotion strengths, opportunities and effectiveness within the various health professions and settings is warranted.

Evidence that health professionals' belief in the positive benefits of physical activity was associated with physical activity promotion was inconsistent but suggested a possible association, particularly where the perceived benefits were linked to the professionals' area of practice. Thus, the dissemination of the broad benefits of physical activity to all health

professionals but with a focus on the benefits related to the health professional's area of speciality could help to increase physical activity promotion.

Health professionals' self-efficacy in physical activity promotion was positively associated with physical activity promotion in nine out of thirteen studies across many health professions. This is consistent with studies of physicians in which perceived self-efficacy in helping patients exercise was generally low, and it has been suggested that enhancing self-efficacy has potential to increase behavioural counselling (Bock et al. 2012). Strategies such as physical activity promotion training and education may have an influence on self-efficacy and consequently increase levels of physical activity promotion (Bock et al. 2012; Bull et al. 1997) and incorporating confidence building activities into the design of health professional training around physical activity promotion may be warranted.

Past reviews (Fie et al. 2013; Huijg et al. 2015b; Lobelo et al. 2016) have reported that a higher personal physical activity level is associated with higher physical activity promoting practices, but nine of seventeen studies in our review showed no association. This discordant finding is possibly due to the considerable variation in the assessment of health professionals' physical activity level and physical activity promotion, as well as the use of self-report, as reported previously (Fie et al. 2013). This makes direct comparison between studies difficult. Nonetheless, it would appear that a higher personal physical activity level may be an influencing factor for some health professionals, though the relationship remains uncertain. Whether health professionals' own physical activity behaviour could be successfully modified and whether any such improvements would subsequently affect their physical activity promotion practices is not known.

Three of four studies reported an association between physical activity assessment and physical activity promotion. High percentages of the non-medical health professionals reported often or always asking their patients about physical activity (61% of psychologists (Burton et al. 2010), 52% of dieticians (McKenna et al. 2004) and 58- 99% of nurses (Buchholz et al. 2009; Burns et al. 2000; Florindo et al. 2013; Johnson et al. 2007) or screening all patients (37% of physiotherapists). Given these figures, physical activity assessment would appear to be a routine component of many of these health professionals' consultations. However, only 8% of general practitioners report screening physical activity in all of their patients (Barrett et al. 2013) and significantly more nurses than doctors consider that their work includes detection of physical inactivity (Steptoe et al. 1999). Assessing a patient's physical activity seems to be a catalyst for promoting physical activity, and all healthcare providers are encouraged to consider adding physical activity as a vital sign for each medical visit (Patrick et al. 2009).

While not present in all studies, most studies did find positive associations between physical activity promotion training and levels of physical activity promotion. However, the content of training and implementation referred to in each study is undefined, and therefore, it is not possible to gauge the fidelity of the exposure to training. In part, this may explain some of the inconsistency between study findings. Additionally, the studies were cross-sectional, relying on participants' recall of past training that may be prone to error. A perceived lack of knowledge, training or skills has been shown previously to be a barrier to physical activity promotion (Eakin, Elizabeth G et al. 2005; Hebert et al. 2012; Huijg et al. 2015b). In Florindo et al's study (Florindo et al. 2013) nurses felt less prepared to advise patients on physical activity than physicians.

Overall, this review supports the notion that physical activity training is associated with physical activity promotion and suggests that all health professionals be provided with physical

activity promotion training (Hebert et al. 2012; McKenna et al. 1998; Scottish Physical Activity Review Group 2008; Vuori et al. 2013). This review suggests that training programs should incorporate strategies to enhance health professionals' self-efficacy, improve their own physical activity levels, develop physical activity assessment techniques and give a broad understanding of the benefits of physical activity and those related to the health professional's area of speciality. The actual impact of training on health professionals' behaviour is unknown, and more research is needed to determine this.

This review has some potential limitations. While a comprehensive range of health professionals were included, gaps remain for some professions including, chiropractors, diabetic educators, pharmacists and podiatrists. The factors and behaviours measured varied between studies, which meant a meta-analysis was not appropriate, and quantitative assessments could not be made. This heterogeneity makes interpretation of associations and drawing firm conclusions difficult. Eakin et al (Eakin, Elizabeth G et al. 2005) in their review also recognise a large variation in study methodologies and calls for standardisation of physical activity outcome measurements in order to improve cross-study comparability. The inconsistency in methodologies may reflect the different practice approaches within the various health professions. This is revealed in a study (Douglas, F. et al. 2006) comparing the assessing and giving of physical activity advice by general practitioners, practice nurses and health visitors that finds an apparent lack of pattern of a systematic practice between each study group making it difficult to make direct comparisons between the professions.

In addition, studies are drawn from different countries and therefore findings of these studies may be shaped by different cultural beliefs around physical activity promotion, different healthcare systems and within that differently defined roles of health professionals, and training.

The review may be limited by the methodological weakness of the included studies. The quality assessment tool (Zaza et al. 2000) gives a broad understanding of the common limitations but does not allow to compare studies quality directly. Nonetheless, our review has many strengths, including that it provides the only analysis of quantitative studies examining associations with physical activity promotion practices in the broader health professions; it used independent study selection, data extraction and quality assessment processes; and incorporates studies of a range of health professions from many different countries.

Conclusion

This review supports an increased focus on the role of delivery of physical activity promotion by the broader health professions. This may help to reduce the burden on medical doctors and increase the reach of physical activity promotion to more of the community.

Future strategies to encourage and facilitate greater physical activity promotion by all health professionals may not need to address lack of time or remuneration, but should consider incorporating the factors identified in this review as potentially beneficial such as physical activity promotion training together with improving health professionals' assessment skills, self-efficacy and their belief in the benefits of physical activity.

Practical Implications

Improving self-efficacy in physical activity promotion, positive beliefs in the benefits of physical activity and assessing patients' physical activity may encourage physical activity promotion, however focusing on practitioner remuneration is unlikely to be a successful strategy to

encourage greater engagement by health professionals. An increased focus on the individual roles of physical activity promotion by the broader health professions is recommended.

Chapter 4 - Understanding the physical activity promotion behaviours of podiatrists: A qualitative study

Crisford, P, Winzenberg, T, Venn, A & Cleland, V 2013, 'Understanding the physical activity promotion behaviours of podiatrists: A qualitative study', Journal of Foot and Ankle Research, vol. 6, no. 1, p. 37.

Background

There is overwhelming evidence of the numerous benefits of engaging in regular physical activity (Haskell et al. 2007; Pate et al. 1995; Warburton et al. 2006). Physical inactivity is linked to an increased risk of mortality and morbidity from a range of diseases and conditions (Australian Institute of Health and Welfare 2008). However, in Australia, a national physical activity survey found that 66.9% of adults were either sedentary or had low levels of exercise (Australian Bureau of Statistics 2012a).

The World Health Organisation emphasises that all health professionals should recognise that physical activity promotion can be used in the prevention and treatment of diseases and that their contact with patients provides an ideal opportunity to promote physical activity (World Health Organization 2004). In Australia a governmental report suggested that health professionals of all types are potentially well placed to provide assessment, practical information, support and referral for individuals who may need assistance to get started, or to maintain regular physical activity (National Public Health Partnership 2005).

There have been a number of studies that have looked at the factors associated with physical activity promotion by health professionals and these have primarily focused on their practice behaviors, knowledge, attitudes and beliefs. The majority of these studies observed general medical practitioners (Glasgow et al. 2001; Gould et al. 1995; Hebert et al. 2012; Winzenberg et al. 2009) with only a limited number of studies giving specific attention to other health professionals such as dietitians (McKenna et al. 2004), nurses (Douglas, Flora et al. 2006; Gould et al. 1995), pharmacists (Kotecki et al. 2000), physiotherapists (Shirley et al. 2010) and clinical psychologists (Burton et al.

2010; Phongsavan et al. 2007). These studies have given insights into the practice behaviors and receptiveness to physical activity promotion of each profession along with the feasibility and practicality of physical activity promotion within each professional setting. The insights gained from these studies are thought to be beneficial in the implementation of effective change strategies (Grimshaw et al. 2002).

While it is possible that these studies and their insights may have relevance to the podiatry profession, little is known about the podiatrists' role in physical activity promotion. There is only limited information reporting the factors associated with the podiatrists' role in health promotion (O'Boyle et al. 2000) and even less regarding their role in physical activity promotion (Moore 2009). At present, clinic practice guidelines for promoting physical activity in the podiatry setting do not exist and furthermore, little is known about the extent to which podiatrists incorporate physical activity assessment and promotion into their clinical practice and the factors associated with it. It is possible that the podiatry setting provides an unexploited and undeveloped opportunity for physical activity promotion and podiatrists could play an important public health role.

The aims of this study, therefore, were to identify:

1. podiatrists' physical activity assessment and promotion practices.
2. the barriers and enablers facing podiatrists in physical activity assessment and promotion.
3. podiatrists' salient beliefs about and attitudes towards physical activity assessment and promotion and their role.

Methods

We performed 20 semi-structured interviews with Tasmanian podiatrists purposefully selected to ensure a broad representation. The sampling frame was a list of Tasmanian practising podiatrists complete with contact details sourced from publicly available health practitioner registers (Tasmania Medicare Local 2011), electronic (Australasian Podiatry Council 2011) and local telephone directories (Yellow pages 2011) and through personal knowledge of one author (PC) (population n = 90). Podiatrists were selected in order to cover a range of demographics to facilitate collection of a diversity of views. Recruitment was by letter of invitation (Appendix 4.1) and non-responders were followed up with a phone call. All participants gave written consent (Appendix 4.2) and the interviews were carried out within the participant' s place of practice or alternatively at a place of their choosing. The interviews were carried out by a research assistant (CC) (n = 8) and by a clinical

podiatrist (PC) (n = 12). Ethical approval was granted by the Human Research Ethics Committee Tasmania (Project number: H12000)

Semi-structured interviews were used because they are well suited for an exploratory study of the participant's experiences and views. They allow the researcher and participant to engage in a dialogue in which initial questions are modified in the light of the participants' responses and the researcher is able to probe interesting and important areas which may arise. This method enables the identification of detailed perceptions, opinions, beliefs, and attitudes of participants whilst allowing for flexibility of coverage and insights into novel areas (Smith et al. 2003). Face to face interviews also have logistical advantages over focus groups, for example, in that they are more flexible as to location and timing, making it easier to accommodate the scheduling of data collection with busy health professionals.

The initial aim was to interview 20 podiatrists, with a view to continuing to interview further participants only if data saturation (no new themes were observed in the analysis, nor new data categories produced) was not achieved with this number of interviews. As data saturation was achieved, interviewing ceased after 20 interviews.

The Theory of Planned Behaviour (TPB) (Ajzen 1991) theoretical model was used in the design of the interview schedule (Appendix 4.3) to help identify and explain the beliefs, attitudes and behaviour in the promotion of physical activity by podiatrists. The TPB states that any given behaviour by professionals is influenced by the individual's intentions to perform the specific behaviour and that these intentions are determined largely by attitudes toward the behaviour, perceived social norms, and perceived control related to the behavior (Ajzen 1991). The TPB has been used to identify and predict healthcare practitioners' behavioural intentions (Millstein 1996). The development of the interview schedule was also influenced by a general overview of the literature and in particular some key papers (Buffart et al. 2009; Bull et al. 1997; Gould et al. 1995; Winzenberg et al. 2009).

Survey information was also collected about each podiatrist' s demographic and physical activity Added "using the International Physical Activity Questionnaire – Short Form (IPAQ-S). The IPAQ instruments have acceptable measurement properties, at least as good as other established self-reports for monitoring population levels of physical activity among 18- to 65-yr-old adults in diverse settings(Craig et al. 2003). However, they have a tendency to overestimate physical activity (Lee et

al. 2011), with the difference between self-reported and accelerometer-measured moderate to vigorous physical activity increasing with higher activity and intensity levels (Hansen et al. 2012). (Appendix 4.4). This allows us to check that we had in fact interviewed a diverse range of participants and to ascertain whether there were any obvious patterns of themes across different demographic attributes. The interview schedule and survey were piloted with two health professionals who were not part of the study. This was done to ensure a clear understanding of questions by both the interviewers and participants. Some minor modifications were made to ensure clarity of meaning.

Each interview was digitally recorded and fully transcribed verbatim. The data were read, reread and analysed separately by two researchers; one researcher (PC) using NVIVO software, and the other, a research assistant (PR), using a coding table. Both researchers used an iterative thematic approach (Fereday et al. 2008) to identify and index common themes and categories. Each produced independent lists of codes and undertook constant and further refinement of coding. Once themes had been identified they were refined, theoretically justified, definitions generated and referenced to the transcripts. Any discrepancies in coding or interpretation of data between researchers were discussed and some minor modifications made until consensus was reached. Regular meetings were held with individual research team members and the team as a whole to discuss themes emerging from the data and contradictory observations. Common themes (or uncommon themes) were checked against demographic and physical activity characteristics of the participants. We systematically searched for any obvious patterns (notable differences or similarities) in the data between the themes according to gender, age ranges, country of origin, qualification, private or public practice, and the amount of physical exercise reported by participants. Extracts or quotes that capture the essence of the theme are included in the results section and supplementary quotes are included in Appendix 4.5. The use of two interviewers and two coders from different backgrounds was undertaken as this approach aimed at gaining a broader understanding of the phenomenon under study whilst limiting the potential risk of individual interviewers' and coders' epistemological perspective or professional identity impacting on the research (Barry et al. 1999; Coar et al. 2006).

Results

32 podiatrists were mailed invitations and non-responders were followed up until 20 podiatrists accepted (62%). The participants interviewed (Table 4.1) included both sexes, pre-registration qualifications were attained across the Australian states as well as from the UK and New Zealand and ranged from certificate level to bachelor's degree with post-graduate qualifications. A wide

range of physical activity levels was reported with most participants claiming above recommended levels of more than 150 minutes per week.

Table 4-1 Demographic and physical activity charcteristics

Characteristics	n	%
Male	8	40
Age		
< 25	2	10
25 - 35	6	30
36 - 45	4	20
46 - 55	6	30
>55	2	10
Practice (full time equivalent)		
< 0.8	5	25
> 0.8	15	75
Practice type		
Private only	16	80
Public only	2	10
Public / private	2	10
Practice area (speciality)		
General only	5	25
Mixed	15	75
Qualifications attained in		
Queensland	1	5
New South Wales	2	10
South Australia	4	20
Tasmania	1	5
Victoria	4	20
Western Australia	2	10
England	4	20
New Zealand	1	5
Physical activity	mean	range
Activity type (Minutes per week)		
Vigorous	67	0 - 720
Moderate	433	0 - 2520
Walking	411	20 - 2520

Common themes extracted from the data were grouped under headings of: physical activity promotion role beliefs, physical assessment practice and beliefs, physical activity promotion practice, barriers and enablers, motivational factors, normative influences, effectiveness of promotion and knowledge, education and skills. Interview quotes have been selected as exemplars to represent each theme. Supplementary quotes may be sourced in Appendix 4.5.

Physical activity promotion role beliefs

Participants saw physical activity promotion as integral to their role as health professionals and to their professional role of keeping people moving through the management of foot conditions:

> *"I think that we keep them on their feet. So that slogan, Podiatry – keeping people on their feet, is a good one, and I feel that if we can keep people moving as long as possible in their lifetime, they'll remain healthier." (Pod 16)*

The participants felt they needed to have a holistic approach to patient care as opposed to focusing on an isolated problem:

> *"I think the fact that there is so much chronic disease around that we have to get better at making sure we see a person as a whole person and not just looking at their feet." (Pod 11)*

They saw they had a role in giving patients information, advice and education on physical activity and its benefits as well as making suggestions or recommendations on physical activity options and encouraging patients to be physically active. They believed physical activity plays an important role in chronic disease prevention and management:

> *"I think we've got a pretty big role, we see a lot of people who aren't active and who have developed things like Type 2 Diabetes and heart problems, and problems with mobility." (Pod 20)*

Additionally, particular mention was made by the participants about the role of encouraging those patients with injury, disease or disability to continue with physical activity:

> *"I think that generally we probably see populations that have come in with some type of injury or disease or disability, so it's part of the role is to be able to educate them of ways that they can continue physical activity while being able to accommodate that disability or injury or whatever may potentially be reducing their current physical activity." (Pod 2)*

Different beliefs about the limitations to the role were evident with some being unsure of their role and the boundaries surrounding their role. Seven of the participants did not consider physical activity assessment, exercise prescription or monitoring to be a role of the podiatrist, rather they

were thought to be the role of other health professionals such as exercise physiologists, GPs and physiotherapists:

> *"I guess I've tended to think that's more for the physio or the GP, but I guess there is a place for us there. But it's never something that I've really considered." (Pod 14)*

Furthermore, they saw part of their role was to refer patients on to other health professionals with more experience, particularly when the patient presented with high risk conditions:

> *"…it depends on the person coming in really. If it's someone who's quite high risk, multiple complex issues, I think err on the safe side, and have to be a referral off to someone who is an expert in the area." (Pod 13)*

Physical activity assessment practice and beliefs

The participant' s decision to assess a patient's physical activity level, was more likely made when the level of physical activity contributes to the presenting condition:

> *"The problem they've got…will often inhibit their physical activity so that becomes part of the discussion about what they're doing and what they want to achieve in terms of where they want to end up being with the treatment." (Pod 12)*

It may also depend upon the patient's characteristics, such as medical history and age. For example, diabetic patients were more likely to be assessed:

> *"Would probably be a middle age, over weight diabetic patient and recently diagnosed as well." (Pod 1)*

Elderly patients and those that present with significant health issues or disability were less likely to be assessed:

> *"Older people… if they're coming in for a general treatment I'm not likely to assess their physical activity. I might encourage them to do more… whereas someone who's coming in with a pain in their foot condition type of thing, I'm more likely to assess them." (Pod 14)*

The way information about physical activity was gathered varied considerably. Assessment often involved informal conversation as well as practitioner-led questions:

> *"I guess once they start talking to you and talk about their health problems, as most of them do, and I guess then you can sort of assess to sort of what level they'd be at and what they could do. That's about it." (Pod 5)*

Or more formally as history taking, particularly in the case of a diabetic or biomechanical assessment:

> *"I guess you do that to a certain extent, probably not a huge written report, but when you see someone, particularly the biomechanics side of it, you are actually looking at what they do, and what they can do." (Pod 15)*

Observation of the patient's physical capabilities and movement patterns was also used as an assessment technique. Often the activity levels of the patient were inferred by appearance:

> *".... if you look at someone who's coming in and they're struggling to get into a normal chair, they're obviously very bariatric, you'd be like, yeah I don't think this person does much, it could be… but if you get someone who's really trim and fit coming in wearing joggers, you tend to think, yeah potentially this person will go for a walk … You shouldn't as a health professional, but they just… it's just there, it's just obvious." (Pod 13)*

> *"…but my ongoing geriatrics would be more like me gleaning information as they walk in, as they walk out, as they move from the chair to the other chair after we get their shoes and stuff on, so it's me just watching everything happening." (Pod 16)*

When physical activity was assessed formally it was part of an injury or biomechanical assessment and commonly the aim was to assess the duration, frequency, intensity and type of activity. It was less common to assess work-related activity, the level of sedentary behaviour or where activity was carried out. Participants usually found it easy to raise discussion about physical activity levels and types with patients, as this was often relevant to presenting conditions.

Barriers to a useful assessment included lack of time and assessment skills along with difficulty in gauging actual levels and types of activity:

> *"If people are retired and they don't do much then sometimes it will be gardening and bits and pieces, that's hard to figure out exactly how much activity they're doing…" (Pod 10)*

There seemed to be a misunderstanding by the participants of what physical activity assessment entailed as some considered this to involve fitness testing for which they claimed a lack of skill. Some expressed concern about the authenticity and genuineness of patients' self-reported physical activity:

> *"I think sometimes they say they're doing a bit more than they probably are, but yeah, it's human nature." (Pod 14)*

Physical activity promotion practice

Participants varied considerably in physical activity promotion behaviour however there was a noticeable unstructured and informal approach taken by the majority. There was also an overwhelming preference for advising walking as an activity along with swimming and cycling or the use of an exercise bike. Participants also reported tailoring their recommendations for individual patients with the advice given dependent upon the patient's age, personal interests, current physical activity levels and capability, health conditions and injuries as well as potential risks to the patient:

> *"I guess it's just getting to know your clients and what they're comfortable with and what you think they can handle." (Pod 10)*

While three of the participants stressed the importance of all patients needing to receive the physical activity promotional message, the approach taken is often opportunistic. Many of the participants reported targeting particular patient types. For instance, it was typical for podiatrists to target those patients with diabetes, or other chronic diseases, who were overweight or who they assumed were sedentary. Participants reported being less likely to promote to patients that they deemed either already active or unable to be active due to a serious health issue or where there was a potential health or safety risk to the patient:

"You get someone with lots and lots of health problems that come in, like someone who's got cancer, and they're having treatment at the moment for cancer, they really don't want to be fussed about knowing that they should do this and that for their diabetes. And I would not be bothered." (Pod 17)

Participants varied considerably in their follow up and monitoring of their patients' activities. Follow up was generally approached opportunistically and informally during conversation with the patient when they came back for a return visit. Systematic follow up did generally occur as a part of an annual diabetic assessment or management of an injury or biomechanical condition:

"I think there is a follow up for those with chronic disease in that you're probably seeing them on an annual basis for their assessments. In terms of the more active group, from people coming in with injuries is definitely follow up because you'd follow them through probably the course of their injury, or at least a reasonable portion of it. But beyond that, probably not, they're probably left to their own devices." (Pod 2)

Participants documented little in the way of their physical activity promotion other than specific recommendations related to the presenting condition. When asked this question, a few participants mentioned that they had not considered it a task they should be doing, however, they could see the value in doing so, particularly in follow up of patients. When it was documented, then it was within the patient notes or as part of a report to the patient's general practitioner or management plan.

Physical activity promotion barriers and enablers

Participants perceived the barriers to promotion, on their part, were associated with a lack of time, resources and knowledge of activity options:

"Knowing what resources are out there and keeping them up to date as well. There are new things that come along that I don't know about, activity groups and things like that. It changes if I'm working in a different setting." (Pod 11)

Also a lack of specific skills, especially exercise prescription knowledge and behaviour change skills:

"Unless you've specifically trained in a particular area and have the skills and knowledge and expertise to be able to assist patients more in that field… but for many podiatrists they

probably haven't had that degree of undergraduate or possibly even postgraduate training. I think if they've got skills, knowledge and confidence in that area to be able to do it well then go for it, I think it would be great." (Pod 9)

Additionally, there was a concern about the potential risks to patients and possible litigation brought about by the information given:

" But I guess because there's always the fear of litigation and saying, you know I think the recommended… putting a time, and putting a number on things, and without having the evidence background, the evidence base… and people might misconstrue the message that you're trying to say." (Pod 13)

Perceptions of barriers presented by the patient were where the patient was perceived by the podiatrist as being unmotivated, unreceptive or having a negative attitude towards physical activity:

" I think usually you can tell fairly early on, like within the first five or ten minutes whether someone's going to actually listen to advice you're giving them, or whether they're just pretty negative and set in their ways and they're not going to change no matter what you say." (Pod 20)

The participants varied in their perceptions of what did and would enable them to promote activity to their patients. Generally, participants considered that the routine consult is an ideal opportunity to promote physical activity:

" I think we're in a really good position where we have the patient there in most cases for probably 15 to 20 minutes, and where we can chat to them while we're looking after their feet, and we can suggest different forms of activity that we think might help them." (Pod 13)

Regularity of these consultations helps to build rapport and familiarity with the patient and provides ongoing opportunities to target and tailor the message as well as to follow up and monitor their promotional efforts:

" We're in an ideal position to be able to monitor them if they are active or becoming active because we see most people on a regular basis, whether it be every 12 months or every two

months… we ask people regularly over a long period of time, so you do get a relationship with your patient." (Pod 8)

It was believed by some participants that they have better opportunities than other health professionals to promote activity due to regular visits and time spent with patients:

" ....musculoskeletal injury that the physios will see that with that fixed they're discharged.... Whereas we keep seeing them every six, eight weeks, whatever, for the nail care. So we generally don't discharge patients.....I think because GPs are so busy, we spend a lot more time with each individual person, that we have the ability to just reinforce those guidelines." (Pod 1)

Many participants recognised that the annual diabetic assessment was a good opportunity to promote physical activity. The patient's level of motivation was often cited as a facilitating factor along with patient rapport. Others felt that having resources such as handouts and visual cues made it easier to raise and communicate the message. Having access to resources and knowledge of local activity options was also believed to make it easier to promote physical activity. A number of participants reported that they felt that formalised strategies along with training in physical activity promotion methods would improve promotional practice behaviour and efficacy:

" Having some good strategies in place that you know work would make a difference, it would motivate you to do it more if you knew something had an 80% success rate and then you would do it." (Pod 12)

A few, particularly public practising participants, felt that a multidisciplinary team approach was beneficial:

" It's something that's part of - certainly in Public Health - part of our ongoing management of these people. We work together quite closely with people like Diabetes Educators and the Endocrinologists and other specialists. We're all pretty much on a similar page with the messages that we try to get out." (Pod 9)

Physical activity promotion motivational factors

The more common reasons for podiatrists' promotion were a desire to improve patients' health through physical activity as well as personal and job satisfaction and a sense of achievement:

> *" .. it makes me feel good to know that I'm helping, and this is why I studied podiatry in the first place, to help people have a good quality of life. And people who can change their lives around will come back and they will generally tell you they're feeling so much better and they can do more, and it makes me feel good. It makes me… it justifies why I choose to do this profession. That's all I'm looking for, for my career." (Pod 2)*

Physical activity promotion normative influences

Participants reported varied sources of normative influence towards promoting physical activity although a number perceive their influence was gained through professional development events, general knowledge and from colleagues:

> *"Well of course, even just going to conferences and hearing people talk about the importance of physical activity and making changes in the community, of course that provides a level of motivation to… for us to promote physical activity." (Pod 2)*

Effectiveness of promotion

The participants reported mainly gauging the success of their promotional efforts through conversational feedback and observational methods. Predominantly it included seeing changes from visit to visit, improvement in the presenting condition, improvements in chronic conditions and weight loss. Some of the more innovative observations mentioned of measuring effectiveness included the ability of a patient to be able to trim their own nails, the state of patients' shoe wear and an increase in the callus build-up on the patients' feet:

> *"I was trimming their nails, because they were just presenting for that, and the diabetes is out of control, to losing a lot of weight and then being able to trim their own nails and been taken off insulin for diabetes…" (Pod 1)*

The participants exhibited a range of beliefs towards their promotional effectiveness from the negative:

> *"To be honest, most people probably don't change that much at all. Most people are probably either the same every year, unless someone was on a health kick one year and the next year they're not or vice versa." (Pod 12),*

To the positive:

> *"I had a patient in last week who, on my advice, has been walking 20 to 30 minutes every day, has lost weight, he's medication reduced, he's really quite happy that I've got him motivated to go and walk every day, so." (Pod 20)*

Three of the participants found it difficult to measure effectiveness:

> *"I don't know that we do it effectively, we'll talk to them but how many people will then be motivated by that advice to go away and change their routine and habits? It's a hard one to measure." (Pod 12)*

Physical activity promotion knowledge, education and skills

It was evident from the reports that there seems to be limited pre- or post-registration physical activity promotion education for podiatrists:

> *"Unless you've specifically trained in a particular area and have the skills and knowledge and expertise to be able to assist patients more in that field… but for many podiatrists they probably haven't had that degree of undergraduate or possibly even postgraduate training. I think if they've got skills, knowledge and confidence in that area to be able to do it well then go for it, I think it would be great." (Pod 9)*

Even so, participants seemed to have a broad knowledge of the numerous physical and mental benefits of physical activity although many had a limited understanding of the specifics of the benefits and the current recommended guidelines. Participants felt they lacked skills and in particular they wished they had more training within physical activity assessment, exercise prescription, behavioral change, counseling and motivational interviewing:

> *"…theoretically if I was going to go down the pathway of really doing proper physical assessments, I'd probably want to do a bit more continued Ed, just to learn a little bit more, feel a bit more confident I guess." (Pod 15)*

Comparisons of themes and demographic data

The only obvious difference between themes across the different demographic attributes were between podiatrists working in the public vs private sector. Public sector practicing participants made more mention of documentation of physical activity promotion:

> *"Usually that's in our management plans so any of our care plans we put together for our patients, in particular for Public Health… in private practice that's just part of the medical records that you put together as part of their ongoing history and usually that's on the front page and gets updated from time to time." (Pod 9)*

Public sector practising participants also more often reported the influence for promotion coming from other health professionals and a team approach:

> *"Those team roles and relationships that we've had and built up for a long time certainly benefit patients in many ways and benefit us in those interprofessional relationships. I think we all end up picking up other messages that have been passed on also so that team approach, I think, is a really good, positive thing for everyone around." (Pod 9)*

The analysis of the data revealed no other obvious differences or similarities between common or uncommon themes and the demographic attributes.

Discussion

To our knowledge this is the first study to provide insight into current practice of podiatrists with regard to physical activity promotion and the factors that influence and prevent podiatrists in enacting their physical activity promotion role. The findings demonstrate that the podiatrist' s unique patient-practitioner relationship appears to provide a significant opportunity for the provision of physical activity assessment, promotion and monitoring during regular routine clinical care. Podiatrists are receptive to their role in physical activity promotion and the profession is well placed, given an appropriate level of training, guidance and support, to play an important role in positively impacting the health behaviours of their patients. Physical activity promotion appears feasible in podiatry practice in terms of opportunity and acceptability to practitioners, but there is scope for improvement. Strategies to improve promotion need to consider the major issues, barriers and opportunities as well as provide a more structured approach to physical activity promotion by podiatrists.

The majority of participants had favorable attitudes towards their role in physical activity promotion and this was echoed by many showing interest in improving their knowledge, skills and practice in the area. A positive and supportive attitude of health professionals has been claimed to be an instrumental factor in promotional behavior (Douglas, F. et al. 2006; Fishbein 2008). This finding is probably not surprising given that there appears to be a natural synergy between physical activity assessment and promotion and the podiatric role, as maintaining or improving mobility and enhancing the independence of individuals is considered core to podiatry practice. It is therefore interesting that seven of the participants considered that the role of podiatrists in physical activity assessment and promotion was limited. It was also revealing that the practice of physical activity assessment and promotion was not universal amongst podiatrists and lacked any real structure. This may be a consequence of there being limited information available to alert them to the role nor is there much in the way of any educational opportunities to give them the knowledge and skills to perform this role. In addition, there are no physical activity promotion guidelines or policies for podiatry and furthermore there is a distinct lack of clarity around the role of all health professionals, in relation to the promotion of physical activity and related health behaviour.

The enablers of physical activity promotion specific to podiatry come from the unique podiatric interaction and relationship with patients. Problem nails, corns, callus and toe deformities are conditions that commonly require regular routine core podiatry care (Farndon et al. 2006), the performance of which appears to provide an opportunity to counsel patients on their physical

activity behaviours. It was interesting whilst some participants felt time was a barrier others were of the view that there was time during routine consultations to enable them to counsel patients. This highlights the need for further assessment of the feasibility and capacity of the delivery of promotional activities during consultations. Many of the presenting conditions often require regular six to eight week consultations over a lifetime which not only builds rapport with the patient but also offers the chance for ongoing physical activity counseling that could be targeted, tailored and combined with continued support. This approach has been shown to be effective in increasing physical activity levels, particularly in the short term (Eakin et al. 2000; Foster et al. 2005).

Many factors identified as potentially influencing physical activity assessment and promotion in podiatry, are similarly identified in studies of other health professionals. In particular, the targeting of particular patients and taking an opportunistic approach to assessment and promotional efforts has been noted in many studies (Douglas, F. et al. 2006; Eakin et al. 2007; Glasgow et al. 2001; Winzenberg et al. 2009). Studies have also shown that patients with particular characteristics, notably those who are overweight and those with chronic conditions, are more likely to receive physical activity counseling (Buffart et al. 2009; Douglas, F. et al. 2006). This contrasts with recommendations that physical activity promotion be provided to all patients routinely by health professionals (Patrick et al. 2009). The description of current practice suggests a lost opportunity for podiatrists to potentially contribute to public health efforts to reduce the burden of chronic diseases by assessing, promoting or following up physical activity with all patients rather than simply “as required” as in the case of the annual diabetic assessment or when it is only relevant to the presenting condition. Our data suggests that the reasons for this are diverse, ranging from podiatrist beliefs about their role and their effectiveness at physical activity promotion, to a lack of skills and educational opportunities.

The suggestion in the data that public sector podiatrists are more likely to document or be influenced by other health professionals’ promotion should be considered carefully. It is possible that public sector podiatrists in Australia do have more stringent documentation policies and procedures, and do collaborate with a more diverse spread of health professionals as compared with private practicing podiatrists. Other factors, such as time and remuneration as well as individual predisposition and organisational support for health promotion may also influence the likelihood of engaging in physical activity promotion procedures such as documentation by the public sector. Our research, however, is unable to determine what influences private vs public podiatrists in promoting physical activity. This observation may be useful in the future studies.

Once a patient has been targeted for physical activity promotion, the tailoring of advice towards patients' characteristics and preferences reported by participants in this study has also been shown to be a common occurrence amongst primary care physicians (Eakin et al. 2007). However, the practice of tailoring advice as opposed to adhering to a standard message has been associated with increases in physical activity levels in the short-term (Eakin et al. 2000), so such tailoring may be desirable. The tailoring of advice to the patient has also been advocated in diabetic education (Kirk et al. 2003; Peek et al. 2007) and foot health education for patients with rheumatoid arthritis (Graham et al. 2012).

Barriers to physical activity promotion perceived by the participants are common amongst other health professionals including the lack of time, knowledge and skills, resources and perceived lack of effectiveness of their efforts and limited patient receptiveness (Eakin, Elizabeth G et al. 2005; Gould et al. 1995; Hebert et al. 2012; Winzenberg et al. 2009). Another barrier, the fear of litigation brought on by giving advice that potentially results in harm to the patient, to our knowledge, has not been reported in the literature and is worthy of investigation in future studies. These inhibiting factors could potentially be addressed though a number of measures including:

1. Training that improves skills, knowledge, effectiveness and consequently confidence.
2. Improved access to resources including written education material and knowledge of local activity options.
3. Development of a systematic approach to podiatric physical activity assessment.
4. An evidence-based formalised strategy for physical activity promotion that is designed to give guidance to podiatrists whilst maximising the effectiveness and efficiency of their promotional efforts.

In support of this, studies with primary care physicians have shown that interventions that include written materials for patients, considered behaviour change strategies, and provide training and materials, have been shown to be effective at increasing levels of physical activity (Petrella et al. 2002).

It is important that consideration be given to the issues of clinical governance (Scally et al. 1998) of physical activity promotion practices in light of comments made by the participants regarding giving physical activity advice, prescribing exercise, exercise counseling and the lack of education and

training. If physical activity promotion by podiatrists is to be encouraged, then podiatry organisations may need to provide podiatrists with appropriate educational and training opportunities to ensure that physical activity promotion is performed safely and, in an evidence-based way. As with any other aspect of their professional practice, podiatrists themselves also need to ensure that they have sufficient knowledge and skills in this area and are aware of the potential risks of and responsibilities associated with physical activity promotion.

While this study is limited to one Australian state, we included participants with a diverse range of demographics and of different physical activity levels from various areas of the state and our findings were consistent with previous research, making us confident that our results are broadly generalisable to Australian podiatrists. As with other physical activity promotion studies involving self-reports (Douglas, Flora et al. 2006; McDowell et al. 1997) there is the possibility of social desirability bias, however we believe that this may not be an issue with this study as there was a wide range of reported levels of promotional behaviour and no podiatrist reported high levels of promotion.

Conclusions

The podiatrist's unique patient-practitioner relationship appears to provide a significant opportunity for the provision of physical activity assessment, promotion and monitoring during regular routine clinical care. Participants were receptive to their role in physical activity promotion and the profession is well placed, given the appropriate level of training, guidance and support, to play an important role in positively impacting the health behaviours of their patients. However, while physical activity promotion appears feasible in podiatry practice there is scope for improvement in promotion behaviour. Strategies to improve promotion need to consider the major issues, barriers and opportunities as well as provide a more structured approach to physical activity promotion by podiatrists. In addition, more work needs to be done to ascertain the actual capacity and feasibility of podiatrists being able to carry out physical activity assessment, promotion and monitoring as part of their clinical role as well as to measure the efficacy and impact of their promotional efforts with patients.

Chapter 5 - What are the factors associated with physical activity promotion in the podiatry setting?

Crisford, P., T. Winzenberg, A. Venn and V. Cleland. 'What are the factors associated with physical activity promotion in the podiatry setting?' Manuscript in preparation.

Introduction

As argued in Chapter 1, all health care professionals are encouraged to promote physical activity to their patients (Global Advocacy Council for Physical Activity 2010; Mutrie 2007; Vuori 2013) because of the numerous benefits of physical activity to health and well-being (Haskell et al. 2007; Warburton et al. 2006). However, while some health professionals promote physical activity to their patients, many do not or if so at low levels, providing much opportunity for improvement (Barnes et al. 2012; Loprinzi et al. 2014; Short et al. 2016).

Podiatrists potentially have an important role in physical activity promotion, given the practice context. A podiatrist's patient load includes a high percentage of elderly patients including those with chronic disease (Axford 1990) and high risk groups with diabetes (Farndon et al. 2009; Nihat et al. 2006), and typical consultations last 20-30 minutes, providing much opportunity for health promotion. However, little is known about podiatrists' perceptions of their role in physical activity promotion, nor their current clinical practice in this regard.

In Chapter 4's qualitative study, podiatrists were shown to be receptive to physical activity promotion and believe there are opportunities to promote physical activity during regular consultations. However, their approach to promoting physical activity was generally opportunistic, informal and un-structured and there were substantial barriers in undertaking physical activity promotion. Whilst this study gave insights into their role and an understanding of their practice, there is little known about the extent to which podiatrists incorporate physical activity promotion into their clinical practice and to what degree particular characteristics or factors influence them in engaging in physical activity promotion. This means that there is little evidence to establish whether podiatry is an appropriate setting for physical activity promotion and whether there is a need for intervention.

The Theory of Planned Behaviour (TPB) (Ajzen 1991) was developed by social psychologists and has been used as a tool to aid in the understanding of a variety of behaviours including health care professionals' practice behaviours (Godin et al. 2008). The TPB has been used to assess health care professional's intention and behaviour to engage in physical activity promotion (Behrens et al. 2014; Faulkner et al. 2001; Sassen et al. 2011). The TPB helps evaluate how the influences on an individual determine that individual's decision to follow a particular behaviour. It achieves this by investigating a distinct set of constructs identified by particular beliefs associated with those constructs. These constructs are thought to determine the individual's intention to engage in the behaviour and represent the value the individual places on the behaviour, the ease with which it can be performed, the views of significant others and the perception that the behaviour is within his/her control.

The objectives of this study were:

1. to describe the current status of podiatrists' physical activity promotion practices,
2. to describe podiatrists' attitudes, social norms, perceived behavioural control, role beliefs and perceived barriers regarding physical activity promotion, and
3. to identify the factors that are associated with podiatrists' engagement in physical activity promotion.

Methods

Ethical approval was obtained on the 17th September 2015 for this study from the Tasmanian Social Sciences Human Research Ethics Committee (Ref no: H0015261).

Sample and Recruitment

In 2016, Australian podiatrists were asked to complete a self-administered online questionnaire via a cloud-based platform (Survey Monkey Online Survey) to gather information on their physical activity promotion behaviours and the potential factors influencing this behaviour. Due to privacy legislation prohibiting the release of contact details, it was not possible to access details of podiatrists registered to practice within Australia (n=4666). Therefore, members of the Australian Podiatry Association (n= 2459) were sent invitations (Appendix 5.1) via an advertisement (Appendix 5.2) in a national hardcopy magazine and in state podiatry associations' electronic newsletters. Podiatrists were also recruited via LinkedIn® (a professional social networking website), promotions at relevant conferences, and via direct email contact (n=887) with contact details sourced from publicly available health practitioner registers, electronic directories, listed public hospital podiatry

departments and academic institutions. An offering of inclusion into a draw for the prize of an iPad mini® was used as a participation incentive.

Measures

A questionnaire was developed based on salient issues specific to podiatrists identified in our previous qualitative work (Chapter 4) and on the findings of our systematic review (Chapter 3) of the factors associated with physical activity promotion in non-medical health settings. Elements of the TPB were also used in development of the questionnaire. Where available, existing questions were used and adapted for use in the podiatry setting. The full survey instrument is shown in Appendix 5.3.

Individual items assessed the podiatrist's characteristics, physical activity assessment and promotion, and beliefs and attitudes regarding physical activity promotion. Items were combined into predefined factor constructs, described below.

Participant characteristics

Personal (age and gender) and practice (years as a podiatrist, work context and postcode) characteristics were collected. Physical activity behavior was assessed by a single-item measure (days in total of 30 minutes or more of physical activity, enough to raise breathing rate) (Milton et al. 2011; Milton et al. 2013; Wanner et al. 2014).

Outcome Variables

Physical activity assessment and promotion

Four items related to assessing patients' physical activity levels were included: the past month frequency of asking new and established patients about their physical activity levels, and assessing patients' physical activity and sitting time (never, rarely, sometimes, often, always) (Burton et al. 2010; Laws et al. 2008; McDowell et al. 1997; McKenna et al. 2004; Wendt 2005). Four items assessed the past month frequency of physical activity promotion behaviours: providing general advice, specific advice, counselling, and follow-up of patients' physical activity (never, rarely, sometimes, often, always). All eight items were assigned scores of 1 to 5 respectively.

Exposure variables

Intentions

The measure of intention to promote physical activity, adapted from previous studies (Faulkner et al. 2001; Huijg et al. 2014a), was assessed by summing two items using bipolar adjectives on a 7-point scale measuring intention to promote physical activity over the next six months (definitely not - most definitely) and likelihood of promoting physical activity in six months (extremely unlikely - extremely likely).

Attitudes

Attitudes (7 items) towards physical activity promotion were gathered through assessing behavioural beliefs towards and outcome evaluations of promoting physical activity. Four items measured bipolar adjectives on a 7-point scale (harmful-beneficial, useful-worthless, unpleasant-pleasant, enjoyable-unenjoyable) (Ajzen 2002a; Faulkner et al. 2001; Huijg et al. 2014a). Three items measured participant agreement on whether they felt satisfied promoting physical activity, whether the patient would appreciate physical activity promotion, and whether the promotion would help the patient become more physically active (strongly disagree, disagree, neither disagree nor agree, agree, strongly agree) with items assigned scores of 1 to 5 respectively (Bandura 1998; Huijg et al. 2014a).

Social norms

Five items regarding beliefs and expectations of others (peers, patients or people important to the participant) concerning promoting physical activity measured social norms (strongly disagree, disagree, neither disagree nor agree, agree, strongly agree) (Ajzen 1991; Huijg et al. 2014a).

Confidence

Participants rated their confidence in six physical activity promotion tasks: assessment of patient physical activity levels, providing general and specific physical activity advice, tailoring a physical activity program, carrying out physical activity counselling and monitoring ongoing physical activity levels of patients (not confident at all, somewhat confident, unsure, confident, very confident) (Bandura 1998; Francis et al. 2004; Huijg et al. 2014a).

Control

Control over the delivery of physical activity promotion (2 items) was measured by participants' beliefs about the degree of ease of promoting physical activity (very difficult, somewhat difficult,

neither easy or difficult, somewhat easy, very easy) and by whether they have control over delivering physical activity promotion to patients (strongly disagree, disagree, neither disagree nor agree, agree, strongly agree) (Ajzen 1991, 2002a, 2002b).

Knowledge and Skills

Participants' reported agreement of whether they had sufficient knowledge and skills to promote physical activity (2 items) (strongly disagree, disagree, neither disagree nor agree, agree, strongly agree).

Role beliefs

Role beliefs (6 items) were measured by asking participants' agreement with statements about their responsibility to provide physical activity assessment, provide general and specific advice, tailor physical activity programs, carry out physical activity counselling and monitor patients' ongoing physical activity levels (strongly disagree, disagree, neither disagree nor agree, agree, strongly agree) (Huijg et al. 2014a; Shirley et al. 2010).

Barriers

Barriers were assessed by nine items about how often (never, rarely, sometimes, often, always) participants thought a lack of: time, skills or knowledge, remuneration, resources, guidelines were barriers to promoting physical activity, and how often they believed that physical activity promotion would not change the patient's behaviour, be beneficial for the patient, be of patient interest, or put the patient at risk (Florindo et al. 2013; Huijg et al. 2014a; Karvinen et al. 2012; McKenna et al. 1998; Shirley et al. 2010).

Past training

Past training in physical activity promotion was assessed by two items asking participants if they had received training at an undergraduate level or attended workshops or seminars on physical activity promotion since graduating (yes/no).

Educational preferences

Participants were asked if they would like to receive training or education on physical activity promotion (yes/no), and their preference options on the education or information type (benefits of physical activity, physical activity assessment, physical activity promotion, physical activity prescription, monitoring patient's physical activity, physical activity counselling techniques,

motivational interviewing techniques and behavioural modification techniques) and format (Via email, posters and handouts, webinar, lecture as part of a conference, half day workshop, or two day intensive workshop) they would like to receive.

Procedure

This survey was pilot-tested among ten purposively selected podiatrists representing diversity in age, gender, and work context. Pilot participants were directed to a website where an information page was provided (Appendix 5.4), and consent given. This was done to assess usability, understandability, consistency, and face validity, with minor wording and ordering modifications made as appropriate.

Data Analysis

Descriptive statistics were used to summarise participant characteristics, participants' beliefs and attitudes regarding physical activity promotion and physical activity promotion. To standardise, the 7-point scale options were transformed into 5-point scales.

Exploratory Factor Analysis (EFA)

EFA was used to identify the underlying relationships between the individual items assessed (i.e. survey questions) and how well they fit the predefined factor constructs. EFA includes error explicitly in the model and thereby reflects the statistical paradigm used in the social sciences (Snook et al. 1989).

Initially, a correlation matrix was generated for the items and items found to be significantly correlated ($p < 0.05$) with providing general advice were included in the EFA. Tests for appropriateness of the correlation matrix, including Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) (Kaiser 1974) and Bartlett's test of sphericity (Bartlett 1954), were conducted.

Potential factors were extracted by using the principal factors method followed by an Oblique Promax rotation which allows for the likelihood that the factors measured are correlated (Schmitt 2011; Schmitt et al. 2011).

In examining the data from the rotated factor analysis, weak items (i.e., factor loadings < 3.2) (Tabachnick et al. 2007) were deleted from further analysis. Cronbach's alpha measured internal

consistency of the combined items within each factor construct and those below 0.7 (Nunnally et al. 1967) were removed from further analysis.

Structural Equation Modelling

Factors identified from the EFA were then used to examine the TPB model using Structural Equation Modelling (SEM). SEM, an extension of multiple regression, allows the examination of how well individual variables are measured and also examines the extent to which the variables are related to each other (Hankins et al. 2000).

Maximum likelihood estimation was used to estimate all factor loadings and coefficients. To standardise the scale of the parameter estimates, the factor loading of one measured variable for each latent construct was constrained to 1.

Model fit was assessed by examining the x^2/df ratio using Kline's (Kline 2015) suggestion of a ratio not larger than 3 times the degrees of freedom. The comparative fit index (CFI), the root-mean-square error of approximation (RMSEA), and the Tucker-Lewis-Index (TLI) were employed and a satisfactory model fit is indicated by high CFI and TLI (>0.90) and low RMSEA (< 0.08) (Tabachnick et al. 2007). Significance levels were set at $p<0.05$ at a 95% confidence interval. Data analysis was carried out using Stata®software version 15 (StataCorp. 2017. College Station, TX).

Results

Respondent characteristics

Three hundred and thirty-one podiatrists responded to the survey, however the final sample used for reporting and analysis comprised 316, as 15 participants' responses were incomplete. Participants who did not respond to all questions were deemed as having incomplete surveys and were not included in the final analytic sample. More respondents were female (60%), the most common age group was 20-29 years, and most were working in the private sector (Table 5.1). The sociodemographic characteristics of podiatrists in this study were similar to those registered nationally through the Australian Health Practitioner Regulation Agency (AHPRA) (Australian Health Practitioner Regulation Agency 2015).

Table 5-1 Respondent characteristics

Characteristics	Study respondents		AHPRA registered
	n	%	%
Gender			
Female	189	60	60
Male	127	40	40
Age			
20-29	98	31	30
30-39	81	26	30
40-49	83	20	22
50-59	59	18	13
60 or older	15	5	4
State			
NSW/ACT	100	32	27
NT	0	0	0.4
QLD	54	17	17
SA	52	17	9
TAS	21	7	2
VIC	53	17	32
WA	30	10	10
Years as a podiatrist			
< 5 years	69	21	NA
5-15 years	122	37	NA
16- 29 years	79	24	NA
30- 40 years	41	13	NA
> 40 years	20	6	NA
Work context			
Private	236	83	NA
Public	35	11	NA
Community	11	4	NA
Academic	7	2	NA
Physical activity frequency			
0 days	13	4	NA
1 day	20	6	NA
2 days	51	16	NA
3 days	55	17	NA
4 days	57	17	NA
5 days	52	16	NA
6 days	31	9	NA
7 days	51	15	NA

	n	%	%
PA promotion training at undergraduate level (Yes)	222	75	NA
Attended PA promotion postgraduate training (Yes)	190	60	NA

Legend: *AHPRA* Australian Health Practitioner Regulation Agency. *PA* Physical Activity

Summary of findings

Physical activity assessment and promotion

Physical activity promotion practiced over the last month is reported in Table 5-2. Sixty-two percent of respondents reported always or often giving general physical activity advice to their patients and thirty-nine percentage gave specific physical activity advice. Thirty-four percent always or often followed up on advice and 18% always or often referred to another health professional for physical activity advice or counselling.

Most respondents reported asking a new patient about their physical activity (86%) with half asking the same of established patients (55%). However, half of the respondents never or rarely asked patients about their sitting time. Less than 9% often or always assessed physical activity using an assessment tool or accepted method of assessing physical activity levels.

Table 5-2 Physical activity promotion and assessment practiced over the last month

	Never/Rarely		Sometimes		Always/Often	
	%	n	%	n	%	n
Gave general PA advice	7.9	25	30.0	95	62.0	196
Gave specific advice	23.1	73	38.3	121	38.6	122
Referred to other health professional for advice	39.6	125	42.7	135	17.7	56
Followed up on advice	32.9	104	32.9	105	33.9	107
Ask new patient about PA	1.8	6	11.5	38	86.7	287
Ask established patients about PA	10.9	36	34.1	113	55.0	182
Assessed PA using a tool	72.8	241	18.1	60	9.1	30
Ask patient about sitting time	51.3	170	25.1	83	23.6	78

Legend: *PA* Physical Activity

Intention

Intention to promote physical activity was strong amongst the respondents with half reporting that they would definitely be promoting physical activity over the next 6 months, and extremely likely to be in 6 months. None reported that they definitely would not be promoting physical activity in the future.

Attitude

Attitudes to physical activity promotion were mostly positive with over half agreeing that patients will appreciate physical activity promotion. Seventy-four percent agreed they would feel satisfied promoting physical activity and 69% felt promoting physical activity will help patients to be more physically active. Most respondents thought, that for them, physical activity promotion was beneficial (90%), useful (92%), pleasant (80%) and enjoyable (79%).

Social norms

Around 50% of respondents neither agreed or disagreed that their peers or important people to them think they should be promoting physical activity. Over 37% agreed or strongly agreed that they are expected to promote physical activity, and 54% believe that respected colleagues promote physical activity.

Confidence

Over three quarters of respondents agreed that they have the confidence to give general physical activity advice and to discuss physical activity options with their patients. However, respondents less commonly agreed that they had the confidence to assess physical activity levels, provide specific advice, monitor patient physical activity levels or carry out physical activity counselling.

Control

Almost three-quarters of respondents agreed that they have control over delivering physical activity promotion and more than half found promoting physical activity easy.

Knowledge and Skills

Over 60% believed they have the knowledge and skills to promote physical activity.

Role beliefs

Most respondents either strongly agreed or agreed that as a podiatrist it was their responsibility to give general physical activity advice to their patients (83%), to assess the physical activity levels of patients (71%) and to monitor patient physical activity levels (60%). They less commonly agreed that it was their responsibility to provide specific physical activity advice (53%), carry out physical activity counselling (47%) or tailor a physical activity program (36%).

Barriers

Barriers that prevent respondents from often or always promoting physical activity included a lack of guidelines (41%), a lack of patient interest (41%), a lack of resources (33%), feeling it would not change the patient's behaviour (29%), a lack of knowledge and skills (24%), and a lack of time (23%). However, less than 6% felt that it would not be beneficial for the patient, and less than 15% of respondents reported the lack of remuneration and less than 19% reported risk to the patient as barriers to promoting physical activity.

Educational preferences

Over 88% indicated that they would like to receive training or education on physical activity promotion, with physical activity assessment and prescription the two most preferred types of education (Figure 5.1). Respondents also chose a range of different format options for receiving the information or education, with webinars and email being the most popular (Figure 5.2).

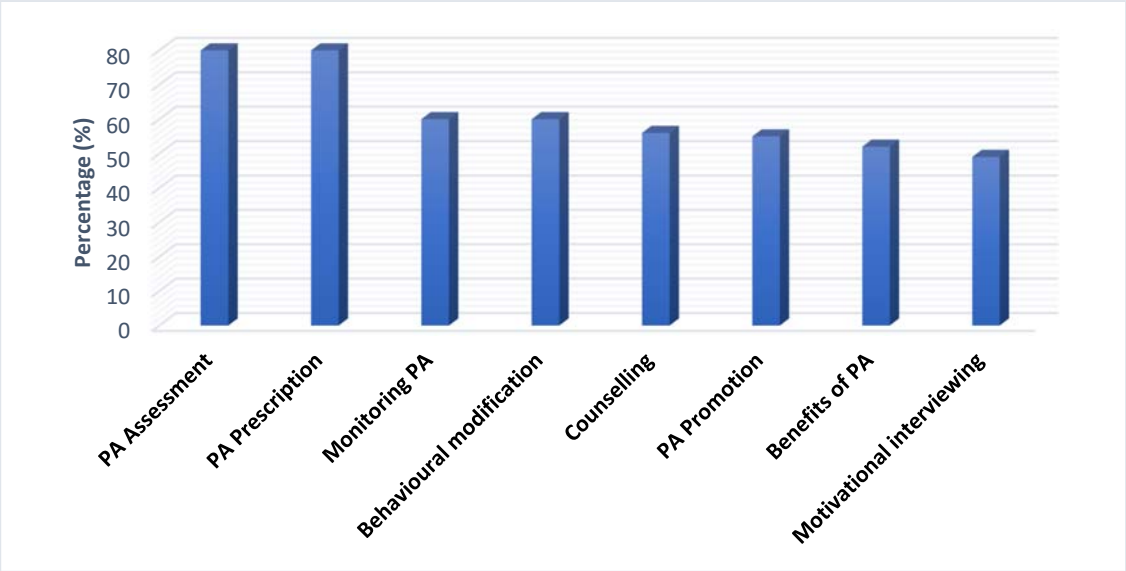

Figure 5-1 Preferences for type of education and information

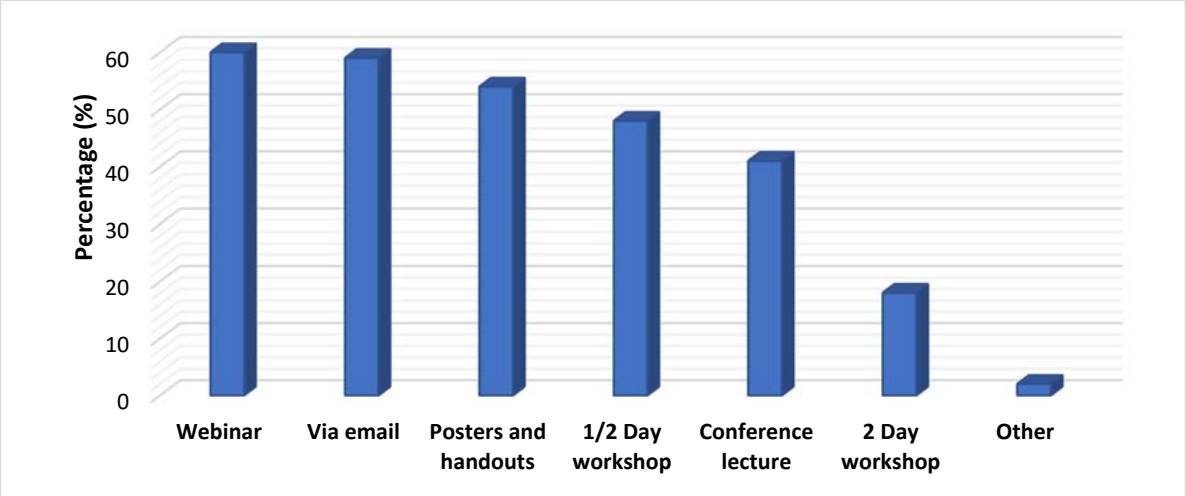

Figure 5-2 Preferences for format of education and information

EFA Results

The correlation matrix (Appendix 4) was found appropriate for factor analysis following results of KMO (0.926) and Bartlett's test indicating that the correlation matrix was not random (x^2 = 9900.12, *df* = 1176, *p* = .000). Most items were found to be only minimally skewed or kurtotic and a considerable number of item correlations also exceed 0.3.

Following rotation, items examined and assessed for factorial suitability that included parallel analysis (Horn 1965) suggested a 10-factor structure. This result was preferable to Kaiser's rule (Kaiser 1974) (7 factors) as parallel analysis is considered a more accurate technique (Velicer et al. 2000) and it is has been suggested that researchers should extract more, rather than too few factors. Six items were removed from further analysis due to failing to load on a factor (physical activity promotion training at both under or post graduate levels; perceived control over physical activity promotion; perceived barriers to promoting physical activity including a lack of time, patient risk and patient benefit). Factor 8 (including barrier items: Won't change patient behaviour prevents me from promoting physical activity, A lack of remuneration prevents me from promoting physical activity and A lack of patient interest prevents me from promoting physical activity) was removed from further analysis as Cronbach's alpha fell below the 0.7 level. As no item loaded on the tenth factor it was discarded and the 9 resultant factors accounted for 68% of the total variance (Table 5.3).

Further evaluation of the adequacy of the number of factors was done by inspecting the correlation residual matrix for high covariance (Gorsuch 1983). There were no values over 1.0, suggesting that no further factors existed (Pett et al. 2003).

The resultant EFA factors, which closely resembled the pre-specified factor constructs, and their explained variances shown in brackets are as follows: Role beliefs (9.6), Intention (8.7%) and Social norms (8.3%). Variations from the pre-specified factor constructs included: combining the physical activity promotion items and the physical activity assessment items into one factor (10%) labelled "Physical activity assessment and promotion"; combining the confidence items with the perceived skills and knowledge items into one factor labelled "Behavioural control" (9.7%); and dividing attitude items into two factors and re-labelling them "Behavioural beliefs" (9.8%) and "Outcome evaluations" (3.2%). The barrier items divided into two factors and were labelled "Enablers" (8.3%) and "Barriers" (3.7%).

Table 5-3 Exploratory factor analysis

Exploratory factor analysis with Promax rotation. Loadings < 0.32	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Uniqueness
Item	PA assessment and promotion	Behavioural beliefs	Role Beliefs	Behavioural control	Intention	Social Norms	Enablers	Barriers	Outcome evaluations	
Provided general PA advice in the past month	0.516									0.388
Provided specific PA advice in the past month	0.712									0.304
Referred patient to other health professional in the past month	0.597									0.570
Followed up PA advice in the past month	0.731									0.339
Asked new patient about PA in the past month	0.349									0.573
Asked established patient about PA in the past month	0.581									0.367
Assessed PA level of patient in the past month	0.477									0.598
Asked patient about sitting time in the past month	0.694									0.546
For me, promoting PA to patients is unpleasant/pleasant		0.851								0.191
For me, promoting PA to patients is unenjoyable/enjoyable		0.903								0.186
If I promote PA, patients will appreciate it		0.571								0.443
If I promote PA, I will feel satisfied		0.444								0.488
If I promote PA, it will help patients be more physically active		0.399								0.477
For me, to promote PA to patients would be difficult/easy		0.360								0.527
It is my responsibility to assess the PA levels of patients			0.561							0.417
It is my responsibility to provide general PA advice to patients			0.393							0.422
It is my responsibility to provide specific PA advice to patients			0.722							0.352
It is my responsibility to tailor a PA program patient's needs			0.799							0.315
It is my responsibility to carry out PA counselling with patients			0.753							0.354
It is my responsibility to monitor ongoing patient PA levels			0.689							0.296
I am confident that I can in assess PA levels of my patients				0.621						0.375
I am confident that I can provide general PA advice				0.861						0.326
I am confident that I can discuss activity options with patients				0.879						0.358
I am confident that I can provide specific PA advice				0.726						0.266
I am confident that I can carry out PA counselling				0.574						0.291
I am confident that I can monitor ongoing patient PA levels				0.551						0.393
I have sufficient knowledge to promote PA				0.640						0.288
I have skills to promote PA				0.706						0.304
I intend to promote PA to patients over the next 6 months					0.892					0.086
In 6 months time, I will be promoting PA to my patients					0.817					0.114
My peers think that I should be promoting PA						0.706				0.472
It is expected of me that I promote PA to my patients						0.795				0.376
Respected colleagues promote PA to their patients						0.693				0.493
People who are important to me think that I should promote PA						0.735				0.344
Patients think I should promote PA						0.657				0.377
A lack of resources prevents me from promoting PA							0.839			0.317
A lack of guidelines prevents me from promoting PA							0.784			0.237
A lack skills or knowledge prevents me from promoting PA							0.552			0.406
Won't change patient behaviour prevents me from promoting PA								0.613		0.435
A lack of remuneration prevents me from promoting PA								0.392		0.748
A lack of patient interest prevents me from promoting PA								0.548		0.570
For me, promoting PA to patients is harmful/beneficial									0.733	0.217
For me promoting PA to patients is worthless/useful		0.345							0.584	0.301
Alpha	.864	.856	.890	.954	.954	.865	.843	.646	.886	
Explained Variance	10.03	9.79	9.68	9.66	8.76	8.33	5.00	3.68	3.22	68.15

SEM Results

The general assumptions of SEM were met with multivariate normality and an adequate sample size. A correlation matrix was generated for latent factor variables (Table 5.4) revealing strong significant unilateral correlations with intention and physical activity promotion.

Table 5-4 Correlation matrix for latent factor variables

Latent factor variables	1	2	3	4	5	6	7	8
1 Physical activity promotion	1.0							
2 Intention	0.60	1.0						
3 Outcome evaluations	0.43	0.60	1.0					
4 Behavioural beliefs	0.63	0.64	0.58	1.0				
5 Social norms	0.48	0.49	0.40	0.49	1.0			
6 Behavioural control	0.54	0.50	0.41	0.53	0.44	1.0		
7 Role beliefs	0.59	0.54	0.46	0.55	0.60	0.61	1.0	
8 Enablers	0.49	0.36	0.24	0.39	0.25	0.50	0.34	1.0

$p < 0.001$

The SEM revealed a model demonstrating adequate fit using multiple goodness-of-fit criteria (Table 5.5). Figure 5.3 shows intention was most strongly influenced by behavioural beliefs ($\beta = 0.35$, $p < 0.001$) and by outcome evaluations ($\beta = 0.27$, $p < 0.001$). Intention was also influenced by enablers ($\beta = 0.18$, $p < 0.05$). Physical activity assessment and promotion were significantly influenced by intention ($\beta = 0.45$, $p < 0.001$) and behavioural control ($\beta = 0.43$, $p < 0.001$).

Table 5.5 Model goodness of fit test results – 8 Factors

	X2/dfx	**RMSEA**	**CFI**	**TFI**	**SRMR**	**CD**
SEM TBP Model	2.37	0.06	0.89	0.88	0.06	1.0

Legend: *CD* Coefficient of determination, *CFA* Confirmatory Factor Analysis, *CFI* Comparative Fit Index, *RMSEA* Root-Mean-Square Error of Approximation, *SEM* Structural Equation Modelling, *SRMR* Standardized Root Mean Square Residual, *TPB* Theory of Planned Behaviour

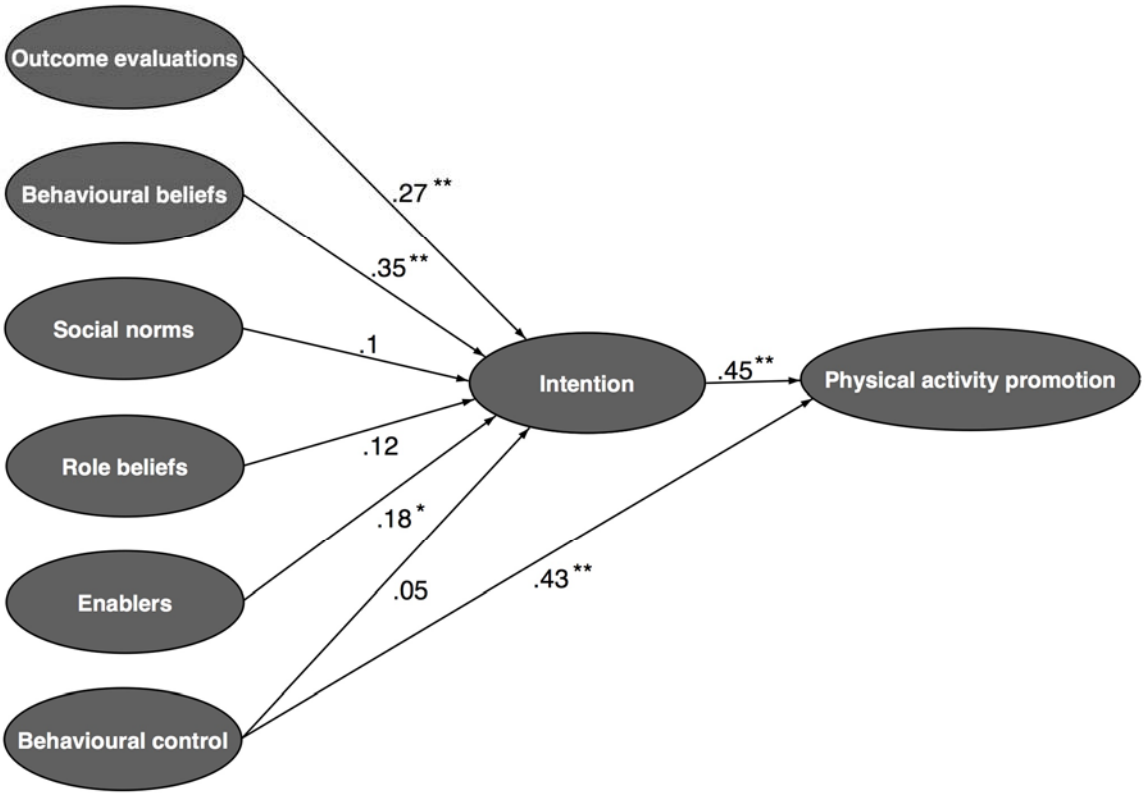

Figure 5-3 Results of Theory of Planned Behaviour Structural Equation Model showing standardised coefficients.

** $p < 0.001$, * $p < 0.05$

Discussion

This study is the first to describe the current status of physical activity promotion in podiatry, and the factors associated with its practice. Most participants reported giving general physical activity advice, had a positive attitude to engaging in promotion, had control over the delivery of physical activity to patients, had confidence in its delivery, and consider giving general advice, assessing physical activity and monitoring patient activity levels part of their role. However, many podiatrists are not delivering any physical activity promotion, and most are not engaging in the more involved practices. Podiatrists' attitudes (behavioural beliefs and outcome evaluations) were the factors most strongly associated with the intention to promote physical activity, and perceived behavioral control was directly associated with physical activity promotion.

The physical activity promotion practices of asking new patients about their physical activity and giving general advice were widespread. The levels of practice are at least comparable, if not higher, than those reported by general practitioners (Buffart et al. 2009) and other health professionals (Freene et al. 2017b). However, there is room for improvement, particularly in the levels of asking established patients about their activity levels, giving specific advice, referral, and following up on patients' physical activity progress. Identifying the factors influencing these behaviours might help to improve delivery (National Institute for Health and Care Excellence 2013).

Participants were generally supportive of their role promoting physical activity. Many, however, did not consider assessing patients' physical activity, asking about sitting time, providing specific advice, referring to other health professionals and following up on advice as a podiatrist's role. Even though role beliefs were not found to be significantly correlated with the intention to promote physical activity, other studies have found that health professionals who saw physical activity promotion as within their role were more likely to provide brief physical activity advice (National Institute for Health and Care Excellence 2013).

Podiatrists had positive attitudes to physical activity promotion, and most believed that promoting physical activity would have a positive outcome for both them and their patient. Positive attitudes including behavioural beliefs and outcome evaluations were leading influences on intention to promote physical activity in this sample. Evidence suggests that intention and behavioural control are significant influences on physical activity promotion in previous studies involving health professionals. For example, a positive attitude was related to higher physical activity promotion levels among physiotherapists and mental healthcare professionals (Faulkner et al. 2001; Huijg et al. 2015a; Sassen et al. 2011). Strategies to boost behavioural and outcome beliefs have the potential to increase podiatrists' engagement in physical activity promotion and are recommended. It is also possible that attitudes of podiatrists may naturally change over time as shown amongst physicians (Buffart et al. 2009; van der Ploeg et al. 2007), with increasing awareness of the benefits of promoting physical activity.

Perceived behavioural control was shown to have a strong significant direct association with physical activity assessment and promotion. This factor is a composite of participant's confidence in carrying out particular promotional tasks and their perception of having the sufficient knowledge and the skills to promote physical activity.

A lack of confidence in carrying out the more complex promotional tasks of promotion and perceived knowledge and skill was evident amongst some participants. Confidence and knowledge are factors that have been shown to be associated with levels of health professionals' engagement in the promotion of physical activity (Huijg et al. 2015b; National Institute for Health and Care Excellence 2013). It is suggested that strategies to improvement confidence along with skills and knowledge in carrying out physical activity promotion (e.g. through training) would increase the likelihood of preforming the behaviour (National Institute for Health and Care Excellence 2013). Limited engagement and confidence in these more involved physical activity promotion practices may reflect a lack of awareness resulting from a lack of podiatry-specific physical activity promotion guidelines or policies, or limited training opportunities for podiatrists to gain the knowledge and skills to perform these practices. It is also suggested that podiatrists may be lacking the necessary skills and techniques in individual promotional techniques (assessment of patients' physical activity behaviours, the provision of brief advice), as these practices are included in recommendations on effective physical activity promotion (Khan et al. 2011; Patrick et al. 2009; Smith 2004).

Having enablers like skills, resources and guidelines appear to have a positive influence on intention to promote physical activity. Therefore, consideration should be given to the development of training, resources and guidelines, the lack of which are considered significant barriers by many podiatrists.

Many podiatrists report having received some form of either undergraduate (75%) and or postgraduate (60%) physical activity promotion training. Even though exposure to training has been shown to be associated with physical activity promotion amongst other health professionals (Burton et al. 2010; Karvinen et al. 2015; McKenna et al. 2004), this study did not find a significant association. It is not possible, however, to gauge the fidelity of the exposure to training and its true influence on the degree of engaging in promotion due to the lack of information regarding the content and implementation of the training. Given the evidence from a number of studies that the provision of training may encourage health professionals to administer brief physical activity advice, a more thorough assessment of the effect of training in podiatry may be warranted in future studies.

This study had some potential limitations. The cross-sectional study design may restrict inferences about causality and the influence of time. The use of self-report measures risks social desirability bias and recall bias, although reliable/valid measures were used where possible. Selection bias may be an issue with those podiatrists more engaged in the promotion of physical activity being

potentially over represented. A non-random sample and a lack of information about non-responders may limit generalisability of the data. However, the demographic characteristics of the sample were very similar to Australian podiatrists generally, providing reassurance. While the absolute response proportion may appear low (i.e. 316 respondents out of a potential 2459 listed podiatrists, or 13%), the actual denominator is unknown, but is likely to be lower than the total number of podiatrists in Australia. This is because it is unlikely that all podiatrists were aware of the study due to the recruitment approaches used. While the sample may have been underpowered to detect associations, samples of over 300 are considered good for factor analysis (Comrey et al. 2013; Tabachnick et al. 2007), communalities are high (common variance shared by factors greater than .60), most factors are defined by several items (Henson et al. 2006), and the sample size-to-variable ratio was 5:1 as recommended (Cattell 2012). Lastly, it should be noted that while the usability and internal consistency of the factor items were tested and determined, other psychometric properties, such as test-retest reliability and validity, were not examined. Despite these potential limitations, this study for the first time provides a comprehensive picture of the physical activity promotion behaviour of and associated factors in a large sample of podiatrists in Australia.

The use of a theory-based design, factor analysis to group factors and SEM are additional strengths of this study. The EFA demonstrated a factor structure that makes conceptual sense, construct validity and good internal consistency, and closely resembled the predefined factor constructs. However, future testing with different samples is warranted as construct validity assessment is an ongoing process. To the best of our knowledge, this is the first time SEM has been used to understand podiatrists' clinical behaviour.

Conclusion

This study is the first internationally to describe the status of podiatrists' engagement in physical activity promotion in a clinical setting, and to identify factors associated with physical activity promotion in this setting. Most podiatrists are keen to promote physical activity to their patients; however, some still do not engage in any promotion and many only provide basic advice. Positive attitudes about physical activity promotion and perceived behavioural control were identified as factors seemingly important for engaging in physical activity promotion. These factors warrant further investigation in future research. This study provides evidence that podiatry has substantial potential as a setting for physical activity promotion, but further work is needed to improve podiatrists' practice behaviours in order increase patients' physical activity levels.

Chapter 6 - Patient perceptions of podiatrist-delivered physical activity promotion

Crisford, P., T. Winzenberg, A. Venn and V. Cleland. 'Patient perceptions of podiatrist-delivered physical activity promotion'. Manuscript in preparation.

Background

Physical inactivity increases the risk of adverse health conditions such as coronary heart disease, type 2 diabetes, breast and colon cancers and shortens life expectancy (Lee et al. 2012). Furthermore, regular physical activity is effective in the prevention of hypertension, obesity, depression and osteoporosis (Warburton et al. 2006). However, only 43% of Australian adults meet physical activity recommendations (Australian Bureau of Statistics 2012a). All health professionals are encouraged to play a role in the promotion of physical activity to their patients (Vuori 2013). However, the proportion of healthcare professionals who regularly advise their patients to increase their physical activity is relatively low (Brauer et al. 2012), and physical activity counselling by healthcare professionals appears to be declining (Loprinzi et al. 2014).

The podiatry profession has a unique patient-practitioner relationship where there is significant opportunity for health promotion during routine clinical care, as well as regular and ongoing contact with patients (O'Boyle et al. 2000). A podiatrist's patient load is made up of many elderly and diabetic patients (Axford 1990; Farndon et al. 2009; Nihat et al. 2006), many of whom may benefit from increased levels of physical activity (Boule et al. 2001; Motl et al. 2010; Sigal et al. 2006; Stessman et al. 2009).

In our qualitative study of podiatrists (Chapter 4), most considered giving general advice, assessing physical activity and monitoring patient activity levels to be part of their role. Furthermore, most reported giving general physical activity promotion advice, had a positive attitude to its promotion, and reported having control and confidence in its delivery. Despite podiatrists' keenness and potential to promote physical activity relatively few podiatrists report engaging to any great degree and to any depth as in providing specific physical activity advice, following up on advice or referring to another health professional for physical activity advice or counselling (Chapters 4 and 5). Furthermore, many podiatrists report significant barriers to promoting physical activity including a

lack of patient interest and a lack of practice guidelines (Chapters 4 and 5). Identification of podiatry patients' experiences and perceptions of physical activity promotion may help evaluate the need for improvement, provide guidance to enhance communication and expectations between patients and providers, and inform strategies to increase physical activity promotion.

In other health settings (e.g. general practice and primary care), the demographic, socioeconomic and health characteristics of patients influence physical activity promotion delivery and the receptiveness of the patient to promotional messages (Damush et al. 1999; Eakin et al. 2007; Flocke et al. 2004; Flocke et al. 1998; Glasgow et al. 2001; Hinrichs et al. 2011; Honda 2004; Morrato et al. 2006; Podl et al. 1999; Sinclair et al. 2008). Patients that receive advice are more likely to be older, male, overweight or obese, have chronic conditions, have lower physical activity levels, and more frequently visit their practitioner. The reason for the consultation, like a "well care visit" or an exercise behavior-relevant diagnosis, or a longer duration of a consultation, are associated with patient recall of a discussion of exercise (Flocke et al. 2004). Patient beliefs and attitudes about physical activity and physical activity promotion are linked to the delivery and receptiveness of physical activity promotion (Burton et al. 2010; Damush et al. 1999; Huijg et al. 2015b). However, in the podiatry setting, little is known about what type of physical activity promotion patients receive, which patients receive it, which patients are likely to be receptive to it, and patients' perceptions of the acceptability of physical activity promotion.

The objective of this study was to provide an understanding of the physical activity promotion interaction from patients' point of view in the podiatry setting. Specifically, it aimed to describe patients':

1. perceptions of which health professionals should have responsibility for physical activity promotion
2. perceptions of the physical activity promotion role of podiatrists
3. experiences of the physical activity promotion behaviours of podiatrists
4. perceptions of the effectiveness of and satisfaction with physical activity promotion by podiatrists.

Method

Ethical approval was obtained for this study on the 7th September 2017 from the Tasmanian Social Sciences Human Research Ethics Committee (Ref no: H0016688 W).

Sampling and recruitment

In 2016-17, the investigators conducted a study (Chapter 5) examining the physical activity promotion behaviours of 331 Australian podiatrists. As detailed earlier, podiatrists were recruited via advertisements in a national hardcopy podiatry magazine, in state podiatry associations' electronic newsletters, via LinkedIn®, and by publicly sourced direct email contact. Of these, 260 agreed to be contacted for further research, and a 130 conveniently selected (focusing on New South Wales, Victoria, South Australia and Tasmania for logistical reasons) were emailed an invitation (appendix 6.1) to participate in the current study. From 16 podiatrists that expressed interest in participating, 10 practices were purposively chosen to reflect a range of practice types and geographic areas (Figure 6.1). From November 2017 to March 2018, 196 patients from the 10 practices were invited to complete an online exit survey on an electronic tablet, hosted via a cloud-based electronic data capture platform (RedCap Version 7.0.19.). Consecutive patients attending for podiatry consultation at the included practices were approached by investigators for inclusion into the study. Patients were excluded if their understanding of the English language was deemed to be not proficient for completing the survey, they were under the age of 18 years, or they had cognitive impairment. Patients that declined the invitation for inclusion into the study were asked if they could answer three questions (age group, gender and new/existing patient status), for the purpose of determining if there were systematic differences between respondents and non-respondents.

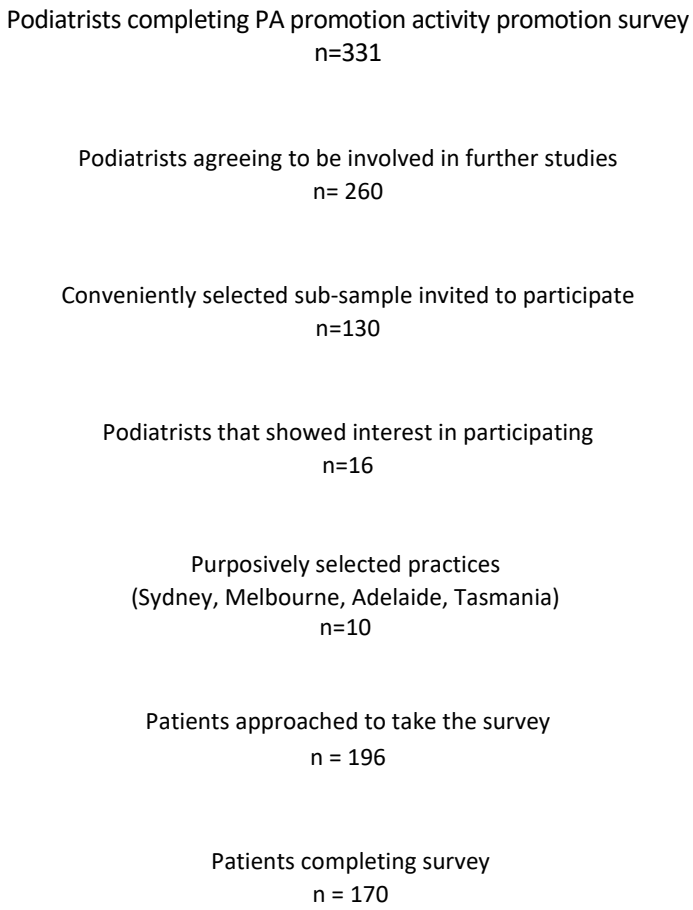

Figure 6-1 Recruitment process flowchart

Measures

A 58-item questionnaire was developed to measure patient perceptions of physical activity promotion, including the factors that may influence the podiatrist to deliver physical activity promotion, and that may influence patient receptivity to physical activity promotion (appendix 6.2). The questionnaire was informed by our prior research into the physical activity promotion behaviours and views of podiatrists (Chapter 4 and 5) and literature focusing on other health professionals and their patients (Courneya et al. 1998; Francis et al. 2004; French et al. 2005; Huijg et al. 2015b; Milton et al. 2013; Sciamanna et al. 2004; World Health Organization 2010a). Where appropriate, existing questions and relevant scales were adapted for use in the podiatry setting.

A pilot study of ten conveniently selected podiatry patients (representing diversity in age and gender) completed the questionnaire to assess usability, understandability, consistency, and face validity, with only minor modifications, described below.

Patient characteristics

Socio-demographic items including gender, age group (in ten-year categories), employment status (working full-time/part-time, not working, home duties, retired, full-time/part-time student, unable to work/ill, other), education level; (low = primary school, year 7-9/10/11/12, medium = trade/apprenticeship, certificate/diploma, high = university degree, higher university degree), and residential postcode. Participant's reported health characteristics including height and weight from which Body Mass Index (BMI) was calculated (weight in kilograms divided by the square of height in meters, kg/m^2) (World Health Organization 2000), smoking status (yes/no), perceived health status (excellent, very good, good, fair, poor) and presence of chronic disease (diabetes, hypertension, cancer, depression, arthritis, stroke, heart disease, high cholesterol, other). Current physical activity level, assessed by a single-item measure (days in total of 30 minutes or more of physical activity, enough to raise breathing rate) (Milton et al. 2011; Milton et al. 2013; Wanner et al. 2014). Regular physical activity was defined as physical activity totalling ≥30 minutes per day at least 5 days per week (World Health Organization 2010a).

Podiatrists' physical activity promotion

Patient perceptions of physical activity promotion delivered during the consultation were collected through the use of 12 survey questions adapted from the Physical Activity Exit Interview (PAEI) (Sciamanna et al. 2004). The PAEI is a brief survey designed to measure the content of physical activity promotion and has shown good concordance of patient and physician recall when examined against audiotapes (Sciamanna et al. 2004). The score range for the modified PAEI is 0 to 12 (i.e., 1 point for each step used). PAEI steps were asked of the present day consult as well as for previous consults over the last 12 months.

Minor adaptations were made to the PAEI, based on pilot testing, that included: 1) minor changes to wording of questions regarding discussing past experiences with activity and activity frequency, intensity and type of recommendations where different wording were used and additional examples provided to improve participant understanding; 2) adding a new question, adapted from a previous survey that used the PAEI (Carroll et al. 2014), which determined whether the podiatrist had referred the patient to programs or other health or exercise professionals to help with physical activity; 3) omitting the question, "Did your doctor give you any written materials about physical activity or exercise during today's clinic visit?" as this question was shown to be misinterpreted by pilot participants as written material for exercise therapy and not for physical activity promotion.

Reason for and frequency of podiatry consultation/s

Participants were asked the primary reason for their consultation, whether this was their first podiatry consultation, whether they were new or existing clients of the practice, and the frequency of their podiatry consultations.

Physical activity intentions and attitudes

Intention was assessed using three items measuring the intention to do 30 minutes of moderate-intensity physical activity on at least five days a week on a five-point scale (Strongly agree to Strongly disagree) (Francis et al. 2004). Attitudes to physical activity were assessed via agreement with four statements "For me, being more physically active in the next 12 months would be…good for me/harmful/enjoyable/boring", each on a five-point scale (Strongly disagree to Strongly agree) (French et al. 2005).

Beliefs about the podiatrist's physical activity advice

Beliefs about the likelihood of acting on the podiatrist's advice (3 items), beliefs about the effectiveness of the physical activity advice (2 items) and satisfaction with the advice (1 item) were measured on a five-point scale (Strongly disagree to Strongly agree).

Role beliefs

One item identified who patients think should be responsible for providing guidance and support on physical activity from a list of health care professionals. Six items about the role of the podiatrist were adapted from a survey of podiatrists' perceptions on physical activity promotion (chapter 5) to assess role beliefs. This used a single question about various physical activity promotion practices (assessment, giving general and specific advice, tailoring a program, counselling, monitoring). All responses were on a five-point scale (Strongly disagree to Strongly agree).

Data analysis

A descriptive analysis identified patient characteristics including; sociodemographic characteristics, physical activity behavior, reasons and frequency of consultation/s, physical activity intentions and attitudes, the podiatrist's physical activity promotion, and physical activity promotion perceptions.

Results

Participant and visit characteristics

One hundred and seventy patients completed the survey of which 63% were female, the largest proportion were in the 60 to 69-year age group, most were retired (60%) and many reported a low education level (44%). Most participants reported good health status (46%), average BMI was 28.3 kg/m^2, most reported at least one chronic condition and less than 4% were smokers (Table 6.1). Forty two percent reported at least 30 minutes physical activity on at least five day a week, similar to the national average (Australian Bureau of Statistics 2012a).

Table 6-1 Participant characteristics

	%	n
Gender (n=167)		
Female	62.9	105
Age (n=166)		
<40	5.4	9
40-49	7.8	13
50-59	9.0	15
60-69	28.3	47
70-79	24.7	41
>80	21.7	41
Employment status (n=166)		
Working full-time	15.0	25
Working part-time	12.7	21
Not in the labor force	10.2	17
Retired	59.7	99
Student	2.4	4
Education level (n=166)		
Low	44.0	73
Medium	21.7	36
High	34.3	57

	%	n
Health (n=166)		
Excellent	10.8	18
Very good	18.7	31
Good	46.4	77
Fair or Poor	24.1	40
BMI kg/m^2 (n = 171)		
Underweight (≤18.5)	2.9	5
Healthy weight (18.5 - 25)	25.7	39
Overweight (25 – 30)	22.2	38
Obese (≥30)	52.1	89
Chronic conditions* (n=170)		
Arthritis	46.5	79
Hypertension	31.8	54
Diabetes	28.2	48
High cholesterol	27.1	46
Heart disease	17.7	30
Depression	10.6	18
other	8.2	14
Cancer	4.1	7
Stroke	1.8	3
No chronic conditions	24.7	42
1 chronic condition	26.0	44
≥2 chronic conditions	49.4	84
Smoker (Yes) (n=166)	3.6	6
Frequency of physical activity (n=167)		
0 days	12.0	20
1 day	10.2	17
2 days	11.0	20
3 days	13.8	23
4 days	10.2	17
5 days	12.0	20
6 days	6.0	10
7 days	24.0	40

General podiatry care including nail care and callused skin removal were the most common reasons for the consultation, 97% of participants were existing podiatry patients and 57% reported having consulted podiatrists for over 5 years (Table 6.2).

Table 6-2 Podiatry consultation reason and frequency

	%	n
Reason for consultation* (n=170)		
Nail care	38.8	66
Corns and callus removal	71.2	121
Diabetes assessment	6.8	11
Footwear advice	5.3	9
Gait assessment	2.0	4
Foot pain assessment and or treatment	11.2	19
Leg, knee, hip or back pain assessment and or treatment	1.8	3
Orthotic therapy	11.8	20
Follow up of previous treatment	12.4	21
Other	5.3	9
Podiatry consult history		
First consult with podiatrist (n=170)	2.94	5
Length of time visiting podiatrists (n=165)		
< 6 months	12.1	20
> 6 months ≤ 1year	4.9	8
> 1 year ≤ 3 years	7.9	13
> 3 years ≤ 5 years	18.2	30
> 5 years	57.0	94
Frequency of consults in the past year (n=165)		
<2	12.1	20
2 to 3	18.7	31
4 to 5	32.1	53
6 – 11	34.6	57
≥ 12	2.2	4
Frequency of practice consultations		
New to practice	10.9	18
Length of time visiting practice (n=147)		
< 6 months	6.8	10
> 6 months ≤ 1 year	3.4	5
> 1 year ≤ 3 years	11.6	17
> 3 years ≤ 5 years	20.4	30
> 5 years	57.9	85
Frequency of consults in the past year (n=147)		
<2	11.6	17
2 to 3	18.4	27
4 to 5	29.9	44
6 - 11	36.7	54
> 12	3.4	5

* Multiple choices allowed

Patient report of physical activity promotion

Table 6.3 shows that about 60% of participants reported discussing physical activity in previous consultations and just under 50% reported discussing physical activity in the current consultation. About 15-20% reported being advised to become more physically active, either in a past or the current consultation. For those patients that reported discussing physical activity, about a third reported discussing past experiences, the reasons why they might want to become more active, and barriers they might encounter when trying to become more physically active**,** in a past consultation. A third of participants also reported receiving specific advice about the frequency, duration and intensity of physical activity, and options for physical activity, in either a past or current consultation. About 20% reported being given a plan or prescription for becoming more physically active in previous consultations, but only 6% in the current consultation. Few patients reported being told that the podiatrist was planning to discuss their physical activity on a future visit (7-9%) or being referred to programs or other health or exercise professionals (2-6%).

Table 6-3 Patient reported physical activity promotion

Physical Activity Exit Interview (PAEI) questions		Yes	No	Cannot recall
	n	%	%	%
Has a podiatrist discussed your physical activity with you?				
In today's consult	170	48.2	51.2	0.6
In previous consults over the last 12 months	165	59.4	33.9	6.7
Has a podiatrist advised you to become more physically active?				
In today's consult	170	15.3	82.9	1.8
In previous consults over the last 12 months	165	20.6	72.1	7.3
Has your podiatrist discussed what reasons you might have to want to become more physically active?				
In today's consult	86*	31.4	61.6	7.0
In previous consults over the last 12 months	101	36.6	55.5	7.9
Has your podiatrist discussed your past experiences with physical activity?				
In today's consult	86*	47.8	47.7	4.7
In previous consults over the last 12 months	101	34.7	34.7	5.9
Has your podiatrist discussed difficult situations you might encounter or problems you might have in trying to become more physically active?				
In today's consult	86*	29.1	67.4	3.5
In previous consults over the last 12 months	101	39.6	54.5	6.0
Has your podiatrist discussed how often you should you be physically active (For example, every day, 5 days a week, once a week)				
Today's consult	86*	31.4	65.1	3.5
In previous consults over the last 12 months	101	26.7	64.4	8.9
Has your podiatrist discussed the length of time you should spend being physically active (For example the number of minutes you need to exercise):				
In today's consult	86*	27.9	67.4	4.7
In previous consults over the last 12 months	101	27.7	67.3	5.0
Has your podiatrist discussed the level of intensity during physical activity (For example, how hard you should exercise)?				
In today's consult	86*	27.9	66.3	5.8
In previous consults over the last 12 months	101	22.8	71.3	5.9
Has your podiatrist discussed options for physical activity (For example walking, riding a bike, swimming, lifting weights, group activities)?				
In today's consult	82*	34.2	61.0	4.9
In previous consults over the last 12 months	101	41.6	54.5	4.0
Have you and your podiatrist put the plan to become more physically active in writing (or as a printout, or as a prescription)?				
In today's consult	86*	5.8	90.7	3.5
In previous consults over the last 12 months	34	20.6	73.5	5.9
Has your podiatrist stated that he/she is planning to discuss your physical activity on a future visit?				
In today's consult	170	6.5	91.8	1.8
In previous consults over the last 12 months	165	8.9	85.5	6.1
Has your podiatrist referred you to programs or other health or exercise professionals to help you with physical activity?				
In today's consult	170	1.8	97.1	1.2
In previous consults over the last 12 months	165	5.5	92.7	1.8

* Sample size is smaller as it includes only participants who answered yes to either "Has a podiatrist discussed your physical activity with you?" and/or "Has a podiatrist advised you to become more physically active?"

Physical activity attitudes and intentions

Patients' physical activity attitudes and intentions are described in Table 6.4. Most participants strongly agreed or agreed that being more physically active in the next 12 months would be good for them and enjoyable. Many also strongly disagreed or disagreed that being more physically active would be harmful or boring. Sixty percent intended to be more physically active in the next 12 months and around half felt that it was likely that they will be more physically active in the next 12 months.

Table 6-4 Patients' physical activity attitudes and intentions (n=170)

	Strongly disagree or disagree	Neither agree or disagree	Strongly agree or agree
	%	%	%
Being more physically active in the next 12 months would be good for me	13.2	10.8	76.0
Being more physically active in the next 12 months would be harmful for me	75.5	13.4	11.4
Being more physically active in the next 12 months would be enjoyable	9.6	18.6	71.9
Being more physically active in the next 12 months would be boring	72.5	13.2	14.4
I intend to be more physically active in the next 12 months	22.2	18.0	59.9
It is likely that I will be more physically active in the next 12 months	25.8	27.0	47.3

Physical activity promotion role beliefs

General practitioners were the most commonly chosen professional thought to have responsibility for physical activity promotion (89%), ahead of physiotherapists (77%), podiatrists (67%), medical specialists (57%), exercise physiologists (55%) and dieticians (52%). Most patients agreed that podiatrists' physical activity promotion role includes assessing physical activity levels (81%), providing general physical activity advice (76%), giving specific physical activity advice (68%), tailoring a physical activity program to a patient's individual needs (59%), carrying out activity counselling (59%) and monitoring ongoing physical activity levels (61%).

Beliefs about the podiatrist's physical activity advice

Participants' perceptions of the podiatrist's advice were mostly positive (Table 6.5) with many strongly agreeing or agreeing that the advice was useful, that they were satisfied with it and that it would help them become more physically active. Many were undecided on its usefulness, their satisfaction with the advice or whether it would help them become more physically active.

Table 6-5 Patients' perceptions of podiatrist's physical activity advice (n=170)

	Strongly disagree or disagree	Neither disagree or agree	Strongly agree or agree
	%	%	%
The podiatrist's physical activity advice is useful for me	3.3	31.2	65.6
I am satisfied with the physical activity promotion advice I have received from the podiatrist	0.8	27.1	72.1
The podiatrist's physical activity advice will help me become more physically active	7.4	42.6	50.0
I expect to act on the podiatrist's physical activity advice	4.1	35.3	60.7
I want to act on the podiatrist's physical activity advice	4.1	29.5	66.4
I intend to act on the podiatrist's physical activity advice	4.9	31.2	63.9

Discussion

This study aimed to provide an understanding of the physical activity promotion interaction between podiatrists and patients. Patients are broadly supportive of the physical activity promotion actions of podiatrists and see that podiatrists have a role to play in physical activity promotion. Around 60% of participants reported that their podiatrist was active in discussing physical activity. However, many patients reported not receiving any advice about physical activity, and if they did, the level of delivery they received appears suboptimal. Those that did receive advice were mostly satisfied, found it useful and believed they would act on it. There appears to be ample opportunity to increase the level of physical activity promotion in the podiatry setting.

The majority of participants endorsed the podiatrists' role in physical activity promotion. A large proportion of patients considered podiatrists to have the responsibility for physical activity

promotion, along with GPs and physiotherapists. This may be partly due to patients' interaction with podiatrists and an understanding of the podiatrist role in improving mobility. Nonetheless, patient perceptions of the role were similar if not more positive than those of podiatrists (Chapter 4). Specifically, 81% of patients versus 71% of podiatrists believe podiatrists should be responsible for assessing physical activity levels, 61% vs 60% for monitoring patient physical activity levels, 58% vs 47% for carrying out physical activity counselling, 68% vs 58% for providing specific physical activity advice, 59% vs 36% for a role in tailoring a physical activity program to a patient's individual needs. The only role where podiatrists were more positive was in the role of providing general physical activity advice (83% vs 76%). This acknowledgement by patients recognises the nexus between the podiatrists' role of keeping people moving through the treatment of lower limb conditions and the role of promoting activity.

Whilst many patients reported discussing physical activity with their podiatrists, there was a considerable number of patients who did not report any discussion about physical activity or past experiences with physical activity. This outcome is of concern as discussing physical activity and physical capability is considered a fundamental component of podiatric clinical practice. Understanding a patient's physical activity history and current physical capabilities are integral for the assessment and management of many of the issues that podiatry patients present with, such as foot and gait related issues, diabetes and falls risks.

Only 15-20% of patients reported being advised to become more physically active. Of those patients who were given advice, many were not receiving an adequate level of advice, recommendations or counselling. It should be noted however, that nearly half the participants were quite active (42% active on five or more days/week) which may explain not having received advice on increasing activity levels. It is recommended that healthcare providers review physical activity levels and offer recommendations to all patients (Sallis et al. 2016a). Few participants reported that their podiatrists engaged in practices such as providing specific advice, referring patients to other health professionals for physical activity advice or counselling or arranging to discuss physical activity on a future visit. Of those participants that reported receiving advice, only about a third reported their podiatrist using counselling techniques such as discussing barriers and enablers (including reasons for becoming active, past experiences with physical activity and difficult situations or problems in becoming active). It is plausible that the more skill and time needed to perform a task may result in a lower likelihood of it being delivered.

These findings are echoed in our previous study (Chapter 4), where podiatrists reported relatively low levels of providing specific advice, counselling referral or follow up for patients' physical activity levels. Patient reports in this study of low levels of physical activity promotion are common amongst other health professionals. For example, around 56% of General Physicians' patients were asked about their physical activity over the last year (Nawaz et al. 2000), 24% of patients were involved in a discussion regarding exercise at any consultation and 11% over the last year (Brauer et al. 2012), 24% to 28% of patients received advice on physical activity (Eakin et al. 2007; Glasgow et al. 2001), 4% reported being counseled about exercise at their last visit (Wee et al. 1999), 38% received help formulating a specific plan and 42% received follow up support (Glasgow et al. 2001). Systematic reviews (Eakin, Elizabeth G et al. 2005; Hebert et al. 2012; Huijg et al. 2015b) have found health professionals feel they lack counselling skills and are uncomfortable about providing detailed advice about physical activity. Additionally, only 24% (Eakin et al. 1997) and 48.2% (Damush et al. 1999) of older adults reported ever receiving a physician's suggestion to exercise.

Of the patients that did receive advice in this study, many were positive about the physical activity promotion they received, being satisfied with the advice, finding it useful and believing they would act on the advice. This is comparable with studies showing that patients are generally responsive to physical activity advice given by physicians (Lewis et al. 1993), and many patients attribute responsibility for promoting increased physical activity to health care practitioners and are keen for support (Leijon et al. 2010), especially older individuals (Booth et al. 1997). For example, psychologists' perception of patients' beliefs about physical activity promotion advice, such as perceived client acceptability, are positively associated with the delivery of promotion (Burton et al. 2010).

Most participants were keen to become physically active, reporting positive intentions and attitudes to physical activity providing a good opportunity for podiatrists to help them increase activity levels. The level of patient motivation has been linked to adherence to physical activity advice with the more engaged or activated patients significantly more likely to participate in healthy behaviour such as getting regular exercise (Fowles et al. 2009; Hibbard et al. 2007; Rask et al. 2009). Those patients who do not think about changing physical activity behaviour are less likely to report receiving a physician recommendation to exercise (Damush et al. 1999). In addition, primary health care professionals' perception of patients' negative attitudes toward preventative intervention and physical activity, and a perception that patients lack motivation are well cited barriers to physical activity promotion (Hebert et al. 2012; Huijg et al. 2015b). Many podiatrists considered a lack of

patient interest and feeling it would not change the patient's behaviour as a barrier to promotion (chapter 5). This study revealed that many patients intend or want to be more physically active, believing it is beneficial for them. Challenges remain, however, with those patients who are not interested in physical activity or are resistant to changing their behaviour. In particular, some older people still believe that physical activity is unnecessary or even potentially harmful (Franco et al. 2015). Identification of the barriers and enablers along with seeking patients' intentions and attitudes to physical activity could prove an appropriate catalyst for its promotion in podiatry practice. An opportunity also exists for podiatrists to support patients in their activity goals over many consultations for a period an extended period of time, possibly years.

This study had some potential limitations. Firstly, participants were recruited by convenience and podiatrists by purpose suggesting the sample may not be representative of the entire podiatric patient population. However, this study did include participants with a broad range of sociodemographic characteristics and a gender ratio and mean age group close to that reported in other podiatric studies (Farndon et al. 2009; Menz et al. 2008). Secondly, recall bias and social desirability bias are potential problems in conducting surveys. The collection of information on the past history, as well as the present-day content of physical activity promotion, may give a broader assessment of the behaviour and reduce observer effect bias (Hawthorne effect). This also considers that promotion may not be delivered at every consult, particularly with patients who visit on a regular basis. There was little difference in the reports of physical activity promotion from today's consult compared to over previous consults, suggesting no observer effect bias. Thirdly, it is acknowledged that even though podiatrists may discuss physical activity or give advice during the course of the consultation, it may not necessarily be recalled by the patient. Whether this is due to deficiencies in the delivery or a lack of patient receptiveness is unknown. Further investigation into the fidelity of the delivery and receipt of physical activity promotion is warranted (Breckon et al. 2008). Nonetheless, strategies to enhance communication and expectations between the podiatrist and the patient are thought to benefit the interaction and adherence outcomes (Gabbay et al. 2011; Zolnierek et al. 2009).

The key strength of this study was its focus on understanding patient perspectives. As patients are recipients of the promotion, identifying their views and experiences are essential. There is also growing awareness of the importance of patient-centred care which is "respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions" (Richardson et al. 2001). Patient-centred care encompasses the need to engage

people as partners in health service delivery and acknowledge the “voice of the patient” in determining what the patient needs and how the provider can meet those needs (Luxford 2010; Silow-Carroll et al. 2006). In addition, patients’ satisfaction, engagement and preferences towards the healthcare service are considered important in order to improve patient experiences and overall care delivery (LaVela et al. 2014) and have been shown to be positively associated with its effectiveness (Doyle et al. 2013).

Conclusions

This study provides evidence for the practice and feasibility of physical activity promotion in the podiatry setting from the patients’ point of view. However, patient reports of physical activity promotion by podiatrists appear low, consistent with literature from other health professions and with findings in Chapter 5, and there appears to be considerable scope for improvement. Strategies that focus on increasing levels of promotion of physical activity in the podiatry setting have the potential to improve health and wellbeing of many patients.

Chapter 7 - Discussion

Physical inactivity is a major risk factor for chronic disease and the benefits that come from being active are many and varied. All health professionals have the responsibility to promote physical activity, including podiatrists. The objective of this thesis was to explore and understand how and why podiatrists promote physical activity promotion behaviours to their patients.

This is the first time the current status, beliefs and attitudes and the factors related with engagement in physical activity promotion in podiatry have been studied. Physical activity promotion in the podiatry setting was found to be feasible and regularly practiced by many podiatrists within the confines of their general consultations. Common physical activity assessment and promotion practices were observed. A variety of factors have an influence on podiatrists' engagement in the promotion of physical activity. Attitudes to and perceived behavioural control in delivering physical activity promotion appear to have an important role. These findings show many parallels with studies of physical activity promotion amongst other health professionals. The podiatry setting appears to provide an opportunity to promote physical activity to patients, there is support for physical activity promotion from both podiatrists and patients, and there appears to be much scope for improving the level and quality of delivery. Strategies that target reducing barriers and facilitating best practice are recommended.

In this chapter, the current status of physical activity promotion and role beliefs of Australian podiatrists are discussed, as are the key factors that influence podiatrists to engage in physical activity promotion, the implications for practice and further research, and the strengths and limitations of this dissertation.

Current status of physical activity promotion amongst podiatrists

This thesis provides an insight into the physical activity promotion practices of podiatrists. Data were collected using mixed methods and provided information on a variety of different forms of assessment and promotional practices. Integration of responses on the various practice approaches showed similar findings across the studies. The assessment of physical activity was included as part of physical activity promotion as it is seen as a catalyst for, and an important component of, physical activity promotion behaviour.

Physical activity assessment

Elementary forms of physical activity assessment appear to be regularly carried out within general podiatric consultations. Similar reports of asking patients about or assessing patients' physical activity behaviors were found across the podiatry studies (Chapters 4, 5 and 6). An informal process was the more common approach with assessment most commonly reported as being by observation (Chapter 4) and by discussion (Chapters 4 and 6) than by the use of a tool or accepted method (Chapters 4 and 5).

Chapters 4 and 5 revealed an unstructured and inconsistent approach to physical activity assessment amongst podiatrists. Integration of a systematic approach into podiatric practice to identify patients at risk and to monitor ongoing activity levels may have additional benefits for podiatric assessment and treatment outcomes. A more methodical approach in the identification of patients' physical activity behaviours may also benefit reliability of assessment over time and between practitioners.

Similarities were shown between levels of assessment reported by podiatrists (55% asking established patients about their physical activity) and patient reports (59%) of discussing their physical activity with podiatrists. Many patients' physical activity behavior, however, is not being identified (Chapters 4, 5 and 6), with as little as 9% of podiatrists using an assessment tool or accepted method to assess physical activity (Chapter 5). This is a surprising finding in that identification of a patient's physical activity and capabilities is fundamental to assessment and management of many podiatry related conditions.

It is recommended that health professionals identify adults who are inactive and who could benefit from interventions to increase physical activity (National Institute for Health and Care Excellence 2013). Furthermore, physical activity assessment should be considered a vital health measure for every patient at every consult (Khan et al. 2011), that is assessed regularly and tracked over time (Sallis et al. 2016b; Strath et al. 2013). Physical activity assessment not only acts as a catalyst for promotion, but also facilitates the subsequent delivery of tailored advice and the monitoring of activity levels (Smith et al. 2017). Podiatrists more commonly assessed patient's physical activity levels when the level of physical activity contributed to the presenting condition, or where it depended on a patient's characteristics, such as medical history and age (Chapter 4). These are findings common amongst other health professions (National Institute for Health and Care Excellence 2013).

This thesis highlights the need for an improvement in the levels of physical activity assessment by podiatrists. There are a number of ways through which this could be done. First, the impact of strategies to increase podiatrists' awareness of the importance of physical activity assessment should be explored. Second, podiatrists may not be aware of the level of acceptance that patients have for physical activity assessment in this setting (Chapter 6), and hence developing mechanisms to share that information with podiatrists are warranted. This is important as there is evidence to suggest that perceived patient receptiveness affects a practitioner's decision to discuss physical activity (National Institute for Health and Care Excellence 2013). Finally, the development of efficient and effective assessment procedures, tailored for the podiatry setting that are acceptable to both patient and podiatrist, may be useful for improving physical activity assessment.

Physical activity promotion

As with physical activity assessment, elementary forms of physical activity promotion also appear to be regularly implemented within general consultations in podiatry. The studies in this thesis have revealed that providing basic advice appears to be widely practiced (Chapters 4, 5 and 6), however, not all podiatrists are involved in doing so. The delivery of basic advice is also a common finding amongst other non-medical health professionals, although it is not practiced by all (Burton et al. 2010; Freene et al. 2017a; Freene et al. 2017b; McKenna et al. 2004). The variation in podiatrist and patient reports of the provision of advice may be due to recall bias by patients or by the podiatrists. However, it is difficult to make direct comparisons between the patient and podiatrist reports as the survey questions differed in some respects.

The other physical activity promotion practices (giving specific advice, tailoring, referral to other health professionals, following up and monitoring advice and behavioural change counselling) were however shown to be less commonly practiced across the studies (Chapters 4, 5 and 6). Various reasons for these lower levels of engagement may exist. Even though podiatrists reported the importance of tailoring their recommendations for individual patients (Chapter 4), only a third of podiatrists agreed it was their role to provide specific advice or tailor a physical activity program (Chapter 5). This may explain why there was little in the way of the provision of specific advice, exercise prescription or tailoring of advice, as reported by both podiatrists and patients (Chapters 4, 5 and 6).

Despite podiatrists describing a preference to refer to other health or exercise professionals to help patients become more active (Chapter 4), the rates of actual referral reported by podiatrists and patients were very low (Chapters 5 and 6). The reasons for this are unknown, although it could be due to a number of factors such as lack of knowledge of (local) referral options, and a lack of skills in the referral process. As such, developing strategies to assist podiatrists to seek out and develop referral systems may be beneficial. An extension to the already existing Enhanced Primary Care (EPC) system to better integrate physical activity promotion between health professionals may be an approach worth considering. Currently, the EPC system includes five visits and may be shared amongst allied health practitioners, therefore placing the burden to pay for extra required visits back on the patient. Podiatrists play an important part in the EPC system and are often the primary point of contact for these EPC recipients servicing 3 million patients in the 2016-17 period, 12% of all referrals, up 430% since 2007-08 period (Australian Institute of Health and Welfare 2018). There are a number of resources available to primary health care professionals such as Royal Australian College General Practice Red Book (RACGP 2016) and SNAP (Harris et al. 2005; RACGP 2015) but these have had limited effect in increasing physical activity advice provided to patients, with referral rates by GPs to allied health services very low (Harris, MF et al. 2012; Passey et al. 2010). The most commonly identified barriers (Denney-Wilson et al. 2010; Harris, MF et al. 2012; Passey et al. 2010) to referral were lack of time, lack of availability of health educators, insufficient reimbursement for preventive services, a lack of systems for tracking and prompting preventive services, difficulty with referral services, relatively time-consuming process to assess patients and more acute patient problems taking precedence over prevention. Patient body mass index was associated with increased likelihood of receiving GP advice or referral for diet and physical activity interventions whereas having poor diet or physical activity levels and being more ready for change were not associated with the likelihood of GP referral(Harris, MF et al. 2012). Assessing readiness to change before offering advice or suggestions may yield improved results from lifestyle counselling (Denney-Wilson et al. 2010). To date, podiatrists are not mentioned in national (National Heart Foundation of Australia 2009; The National Physical Activity Plan Alliance 2016) or international physical activity plans (The National Physical Activity Plan Alliance 2016; World Health Organization 2010, 2018), and their physical activity promotion role in the multidisciplinary team remains under-explored.

Podiatrists' reports on following up on advice or monitoring patients' physical activity behaviours were mixed and were typically approached opportunistically and informally (Chapter 4). The practice of following up or planning to discuss physical activity on a future visit was less than optimal (Chapters 5 and 6). It is important to encourage follow up and monitoring of patient's physical

activity behaviours as well as any advice given, because not only is follow-up recommended, it has also been shown to increase physical activity (Eakin, Elizabeth G et al. 2005; Foster et al. 2005; Gagliardi et al. 2015; Pinto et al. 2001; The National Institute for Health and Care Excellence 2006).

Although many podiatrists are keen to pursue behavioural counselling, its practice was limited (Chapter 4 and 6). Although the reasons for this cannot be determined from this thesis, it may be indicative of a lack of training, skills or exposure to behaviour change techniques (Chapter 4). A systematic review of 12 studies (Kunstler et al. 2018b) found that physiotherapists also use only a small number of behaviour change techniques in practice to promote physical activity. Nonetheless, psychologists with extensive training in the theory and practice of behavior change are willing and potentially able to promote physical activity as part of psychological treatment (Burton et al. 2010).

Many podiatrists were keen to receive training and education about physical activity assessment and promotion (Chapter 5), as well as showing interest in taking on more complex tasks such as providing specific advice and behavioural counselling (Chapters 4 and 5). However, few are doing so, and as such there is a need for the development of strategies to enable podiatrists to promote physical activity more regularly and to a greater degree. Further work could address this need by testing the impact of such strategies.

Role beliefs

The vast majority of podiatrists felt it was part of their role to provide general physical activity advice (Chapter 5). This finding aligns with podiatrists' beliefs that physical activity promotion is integral to their role as health professionals and to their professional role of keeping people moving through the management of foot conditions (Chapter 4). Their role across the physical activity promotion tasks also has majority patient support (Chapter 6). However, many podiatrists (Chapter 5) and patients (Chapter 6) are either uncertain or less positive about the role, particularly with regards to the more complex promotional tasks, such as tailoring a physical activity program and carrying out physical activity counselling. This is again consistent with beliefs amongst podiatrists about the limits to their role, evident with some being unsure of their role and the boundaries surrounding their role (Chapter 4). Some of the podiatrists did not consider physical activity assessment, exercise prescription or monitoring to be a role of the podiatrist, rather they were thought to be the role of other health professionals, such as exercise physiologists, general practitioners and physiotherapists and were more likely to refer patients on to those with more experience, particularly when the patient presented with high risk conditions (Chapter 4).

Furthermore, not all podiatrists felt that they have a responsibility to give general physical activity advice to their patients. It appears that podiatrists may not be as comfortable with their role when compared to other professions as the vast majority of non-medical health professionals (86-100%) agree that discussing the benefits of a physically active lifestyle and suggesting to patients ways to increase daily physical activity was part of their role (Freene et al. 2017b). This may result from a number of factors, such as limited exposure through a lack of training either at undergraduate or post graduate levels. Alternatively, a lack of organisational encouragement or support may impact on role beliefs. Further research could focus on establishing a better understanding of why podiatrists don't think this is part of their role.

There is much opportunity for the podiatry profession to enhance its role, but this should come as a holistic professional endeavour. Achieving this may require a number of targeted initiatives, such as an integrated and comprehensive approach through professional organisations and training institutions that supports and encourages podiatrists in their role. To assist this process, it is suggested that position statements, recommendations and/or guidelines be developed. The development and dissemination of physical activity promotion guidelines is suggested to assist health professionals in decision-making and can become a part of professional quality assessment (National Public Health Partnership 2005; Taylor et al. 2004). Furthermore, the World Health Organization Global Action Plan on Physical Activity 2018–2030 (World Health Organization 2018) recommends that medical and professional societies support the development and dissemination of resources and best practice guidance on the promotion of physical activity and adapt their support to different contexts and cultures and health-care providers.

Factors that influence podiatrists to engage in promotion physical activity

Attitude

A positive attitude, specifically positive behavioral and outcome beliefs, had the strongest influence on the intention to engage in physical activity promotion (Chapter 5). Most podiatrists had positive attitudes towards promoting physical activity. Positive attitudes to promoting physical activity were also found amongst podiatrists when interviewed (Chapter 4), with many stating that they could see the potential benefits for both themselves and their patients.

This finding is consistent with the findings in the systematic review (Chapter 3) that showed positive associations between positive attitudes to physical activity promotion and physical activity promotion practice in three studies of mental health care professionals (Faulkner et al. 2001) and physiotherapists (Huijg et al. 2015a; Sassen et al. 2011). A more recent study has shown that physiotherapists that felt physical activity promotion would not change their patients' behaviour were much less likely to promote physical activity than those that felt it would change patients' behaviour (Freene et al. 2017a). A positive attitude toward physical activity promotion is also one of the most cited factors perceived to positively influence physical activity promotion among primary healthcare professionals (Huijg et al. 2015b).

As mentioned in the introduction (Chapter 1) health professionals' perception of their own role is an important factor in enacting that role. When a practitioner perceives it their remit or role, they are more likely to discuss and promote physical activity (The National Institute for Health and Care Excellence 2006). Organisational support and the dissemination of information regarding their role and responsibility has the potential to improve podiatrists' attitude to their role.

Perceived behavioural control

Greater perceived behavioural control, specifically greater confidence in physical activity promotion tasks and perceived knowledge and skill, showed a strong association with physical activity promotion (Chapter 5). This is consistent with findings from our systematic review (chapter 3) that showed higher confidence or self-efficacy in physical activity promotion was one of the main factors associated with physical activity promotion among non-medical health professionals. The qualitative findings (Chapter 4) also revealed that a perceived lack of skills and knowledge was considered a significant barrier to engaging in physical activity promotion by podiatrists.

A perceived lack of knowledge is one of the factors most cited by health professionals that negatively influences their engagement in the promotion of physical activity (Huijg et al. 2015b). A survey (Freene et al. 2017b) found Australian nurses and allied health professionals were generally confident to promote physical activity to patients in several healthcare settings, but many lacked sufficient physical activity knowledge, limiting their physical activity promotion behaviours. A recent study of physiotherapists (Kunstler et al. 2019) identified that knowledge (knowing how to promote non-treatment physical activity) was significantly and independently associated with non-treatment physical activity promotion. Another study of physiotherapists (Freene et al. 2017a) found those

who felt they lacked counselling skills were much less likely to promote physical activity than those that felt they have the counselling skills. As consistently demonstrated by the studies in this thesis (Chapters 3, 4 and 5), strategies such as physical activity promotion training and education may improve confidence, skills and knowledge and consequently increase levels of physical activity promotion. Training to improve self-efficacy in promoting physical activity has also been suggested in other healthcare settings (Bock et al. 2012; Bull et al. 1997).

Barriers

A lack of remuneration, time and training are commonly cited barriers to physical activity promotion for primary health practitioners (Eakin, Elizabeth G. et al. 2005; Hebert et al. 2012; Huijg et al. 2014b). These factors did not appear to be significant barriers for podiatrists (Chapter 6) and this finding is comparable with other non-medical health professionals (Chapter 3). It appears that podiatrists are well positioned and prepared, relative to other health professionals, to provide and physical activity promotion.

Implications for practice

Opportunity

It is evident from the findings from the primary studies (Chapters 4, 5 and 6) that physical activity promotion in podiatry is feasible and has the support of both podiatrists and patients. Podiatrists are well placed to promote physical activity, and the podiatry setting provides much opportunity and scope for promotion of physical activity. Basic physical activity promotion is practiced as part of usual podiatry consultations (Chapters 4, 5 and 6), and podiatrists also appear to have a good level of self-efficacy including the confidence, skills and knowledge to at least provide basic advice (Chapters 4, 5 and 6).

Patients feel comfortable receiving physical activity promotion advice from podiatrists (Chapter 6) and this may be partly due to frequent contact which provides the ability to develop a trusting, therapeutic relationship. The regularity and longevity of patient visits reported in Chapters 3 and 6 provides the opportunity to build these relationships to enact behavioural change techniques and to monitor ongoing physical activity behaviours. Many other health professionals may only see patients infrequently or for short periods of time. Physiotherapists for instance, only generally see their patients for a number of occasions (e.g. 4-6 consults) for musculoskeletal problems, limiting the

opportunity for long term monitoring of physical activity behaviours. Consideration of how to better utilise the unique consultation opportunities in podiatry is warranted.

Considering that the majority of podiatrists and their patients support the roles of assessing and monitoring patient physical activity levels and providing general advice (Chapter 4, 5 and 6), there is opportunity for increasing the degree and level of promotion of physical activity. It is interesting that patients tended to have higher valued role perceptions than podiatrists across the different physical activity promotion tasks (Chapter 5 and 6). This difference in role perspective may be due to a lack of confidence, skills or knowledge on the part of the podiatrist, or again may be partly due to the trust and respect built up from a long-term relationship with the patient.

Part of the multidisciplinary team

In Chapter 4, public sector practising podiatrists reported the benefits of a team approach. For the podiatrists who believe particular physical activity promotion approaches were outside their role, confidence or skill level (Chapters 4 and 5), it is important to be able to easily access other health professionals with the skills and knowledge within their local area. Collaboration between health care professionals may help facilitate referral of patients in need of more specialised physical activity advice or counselling. Fostering a multidisciplinary team approach and further promoting co-operation between health professions with regard to increasing and or maintaining patient physical activity levels may assist in providing the foundation for improved communication continuity of care, and facilitate information sharing necessary in attaining successful patient outcomes (Australian Institute of Health and Welfare 2018).

This multidisciplinary team approach could incorporate patient education and support by developing a shared focus on specific problems, targeting goals and developing a specific action plan; support and problem-solving to optimise self-management; closer monitoring of adherence and outcomes and facilitation of appointments for patients with adverse outcomes or side effects to the primary care physician or specialist (Katon et al. 2001). Non-medical health professionals can support the patient with the time and frequency of contacts needed to enhance patient self-management and activation, and to monitor physical activity levels.

Providing consistent physical activity promotional strategies and messages has been recommended (The National Physical Activity Plan Alliance 2016; World Health Organization 2010), particularly

across multi-disciplinary teams (Physical Activity Guidelines Advisory Committee 2018), so this is an important consideration for further work.

To date, podiatrists are not mentioned in national (National Heart Foundation of Australia 2009; The National Physical Activity Plan Alliance 2016) or international physical activity plans (The National Physical Activity Plan Alliance 2016; World Health Organization 2010, 2018), and their physical activity promotion role in the multidisciplinary team remains under-explored.

Rethinking patient management

Whilst many health professionals may be familiar with the primary preventative benefits of regular physical activity, they may be unaware of the numerous secondary and tertiary benefits. While podiatrists mentioned their role of encouraging those patients with injury, disease or disability to continue with physical activity (Chapter 4), some may not be aware of the benefits of regular physical activity in the management conditions that may present to them. There was little mention of the benefits of physical activity for those patients suffering from musculoskeletal issues such as knee arthritis or those at risk of falls (Chapter 4), and little discussion of the management of chronic conditions (Chapter 4). Currently, more emphasis is placed on primary prevention of disease even though many chronic conditions are drastically improved when physical activity and exercise are part of a medical management plan (Durstine et al. 2013). With strong evidence for improvements in the effects and progression of conditions commonly presenting to podiatrists, it is important that podiatrists are fully aware of the benefits of regular physical activity for these and other conditions. Providing podiatrists with the knowledge of the many secondary and tertiary benefits of physical activity and giving them the skills to use physical activity promotion as a management tool for presenting conditions or pre-existing health conditions may potentially lead to an increase in promotional behaviour of podiatrists.

A focus on older adults

Podiatrists are in an ideal position to provide older adults with advice and support through the promotion of physical activity (Chapter 6), however, it appears that podiatrists may not be providing older adults with the necessary attention (Chapter 4). Podiatrists need to be aware of the importance of not only assessing older adults' activity behaviours, but also making patients aware of their behaviours, including sitting time. With numbers of adults aged 65 years and older projected to double by 2050 (World Health Organization 2015) and the prevalence of multimorbidity increasing (Salive 2013) podiatrists are in a position to support older adults to increase and maintain physical

activity. It is recommended that almost all older adults should be physically active and given the evidence, physical activity should be one of the highest priorities for preventing and treating disease and disablement in older adults (Nelson et al. 2007). While some older people recognise the benefits of physical activity, some do not and there are a range of barriers to physical activity participation (Franco et al. 2015). Podiatrists should be prepared with training and resources to enable them to provide older adults with the appropriate physical activity assessment, advice, support and follow-up they require.

Implications for further research

The knowledge gained from this thesis will be used to inform further studies in the development and evaluation of intervention strategies to assist podiatrists in effectively promoting physical activity during routine clinical practice.

Development and evaluation of physical activity assessment and promotion procedures

This thesis has revealed a need for improvement in physical activity assessment procedures. Physical activity assessment levels appear suboptimal (Chapter 5 and 6) and more specifically, podiatrists claim they lack assessment skills and find it difficult to gauge the actual levels and types of activity, particularly with older people (Chapter 4). Furthermore, whilst the physical assessment practices identified may be adequate to assess the need for patient improvement or provide a stimulant to start the conversation, the levels of assessment may not be ideal for basing physical activity advice or counselling to improve patient physical activity levels. This thesis was unable to gauge the content, fidelity or effectiveness of physical activity assessment behaviours in podiatry.

Existing physical activity assessment techniques need to be evaluated for their acceptability and feasibility in the podiatry setting. Different tools need to be assessed, over time, and with different clinical populations. Considerations should be given to their use with different chronic conditions, significant health issues or disability, poorer health literacy and different age groups, including the elderly (Golightly et al. 2017). Furthermore, physical activity assessment procedures need to be easily integrated into general podiatry consultations to the satisfaction and acceptability of both podiatrists and patients.

> *"Health care professionals are more likely to use physical activity assessment tools when they can understand its value, its fit in current service provision (or perceived potential fit) and if the participants (health care professionals and patients) have sufficient support to implement the proposed change"* (Smith et al. 2017).

There are a number of existing practical ideas and instruments that may be easily into podiatry clinical practice to assess and monitor physical activity including both self-report objective measures. Use of waiting room or consult physical activity questionnaires (including either the single-item measure (Milton et al. 2010; Milton et al. 2013), The Physical Activity Vital Sign (Greenwood et al. 2010), Exercise Vital Sign (Coleman et al. 2012) and The Rapid Assessment of Physical Activity for older adults (Center 2006; Topolski et al. 2006)) show an acceptable level of feasibility, validity, and effectiveness (Lobelo et al. 2018). mHealth technologies that gauge and monitor physical activity levels, including wearable activity monitors have been also been assessed for their use in healthcare settings. A report from the American Heart Association (Lobelo et al. 2018) finds consumer-oriented wearable devices or smartphones to be feasible tools for objectively assessing physical activity levels, but work is still needed to ensure sound validation efforts. In addition, it is important to note that they rarely summarise physical activity data consistently that clinicians can understand and use to guide clinical management.

There appears to be a need for improvement in physical activity promotion procedures. It is reasonable to conclude that podiatrists possess some degree of competence in physical activity promotion given the reports from both podiatrists and patients (Chapter 4, 5 and 6). However, it is unknown whether podiatrists have the adequate level of skills and knowledge to effectively manage patients' physical activity behaviours.

Integration of brief advice and counselling into general podiatry treatment sessions may be the most feasible and practical form of physical activity promotion that has been shown to increase self-reported physical activity in the short term (Lamming et al. 2017). Brief advice may include verbal advice, discussion, negotiation or encouragement, with or without written or other support or follow-up. It can vary from basic advice to a more extended, individually focused advice (The National Institute for Health and Care Excellence 2006). Furthermore, brief advice that is tailored to the patients and includes follow-up may be more effective in increasing patient activity levels (National Institute for Health and Care Excellence 2013). A practice that is closely related and relevant to podiatry practice would be more likely to be implemented. It is also important to identify

acceptance by both podiatrist and patient and that it is able to be delivered as prescribed. When developing physical activity promotion interventions, consideration should be given to treatment fidelity with careful attention to the design, training, delivery, and receipt of physical activity promotion (Breckon et al. 2008).

Behavioural change counselling or techniques may also appear to be a good fit for podiatry practice as better outcomes are shown to be achieved where strategies include multiple sessions and those targeted to insufficiently active patients (Gagliardi et al. 2015; Sanchez et al. 2015).

Consideration should be given to the development of referral systems to other more qualified health professionals and exercise professionals for physical activity advice or counselling. Barriers to referral commonly identified amongst GPs including a lack of time, insufficient reimbursement for preventive services, and the length of time taken to assess patients (Denney-Wilson et al. 2010; Harris, MF et al. 2012; Passey et al. 2010) may not be significant barriers to podiatrists referring patients as demonstrated by our study (Chapter 5).

Future research should also focus on evaluation of efficient, effective and appropriate physical activity promotion interventions in the podiatry settings. This would require well-designed high-quality randomised controlled trials that test the effectiveness of physical activity promotion interventions. Qualitative research focusing on intervention receptiveness and satisfaction of both podiatrist and patient, which is critical for understanding how and why interventions do or do not work and how transferable they might be (Pope et al. 2002).

Development, assessment and provision of training and education

There is a need to ensure that podiatrists are appropriately trained and educated in the assessment and promotion of physical activity. Physical activity promotion education and training are recommended for all health professionals at both undergraduate and post graduate levels (Jacobson et al. 2005; Petrella et al. 2002; The National Institute for Health and Care Excellence 2006; The National Physical Activity Plan Alliance 2016; World Health Organization 2018). The World Health Organization Global Action Plan on Physical Activity 2018–203 (World Health Organization 2018) recommends that:

"Medical and other health professional societies and interested stakeholders should support the development and delivery of appropriate in-service training programmes on how to assess and counsel patients on physical activity, particularly focusing on the least active patients."

The Australian Health Practitioner Regulation Agency (AHPRA) accredits and monitor education university-based podiatry programs of study to ensure that graduates are provided with the knowledge, skills and professional attributes. However, there are no specific or mandatory requirements that universities include information about physical activity assessment, prescription, and promotion within their podiatry curricula.

It is recommended that stazndardised physical activity promotion education and training be integrated into undergraduate curriculums of Australian podiatry universities and that continuing education opportunities be provided by the relevant organisations. However, little is known about the specific content of education or training in Australia or anywhere else in the world and more research is needed to better understand existing educational opportunities available to podiatrists.

Physical activity promotion training was one of the main factors associated with engaging in physical activity promotion amongst non-medical health professionals. However, there is little evidence as to the efficacy of training and the level and intensity of training that health professionals receive is unknown. Even though most Australian medical schools report including some physical activity education in their medical curriculum, it is unlikely that the attention it currently receives adequately prepares medical students (Strong et al. 2017). There also appears to be limited content regarding physical activity promotion training and education in the osteopathic (Zamani et al. 2007), pharmacy (Dirks-Naylor et al. 2016) and physiotherapy (O'Donoghue et al. 2012; O'Donoghue et al. 2011; Taukobong et al. 2013) undergraduate curriculums, other than as for a therapeutic modality.

The best type and method of delivery of training remains uncertain and the association with increasing patient physical activity levels is speculative. There is little evidence to recommend one form over another. As suggested in the systematic review (Chapter 3), the actual impact of training on health professionals' behaviour and patient physical levels is unknown, and more research is needed to determine its influence.

Nonetheless, studies have recommended various forms training for health professionals (Edwards et al. 2015; Jacobson 2005) and some pre-existing forms of training may suit podiatry practice. When developing training interventions, it is suggested that considerations be given to efforts to bolster those who lack self-efficacy (Chapters 3 and 5) and that promotion be brief enough to be able to be incorporated into clinical practice (Chapters 3, 4 and 5). Additionally, it is suggested that knowledge about physical activity recommendations (Chapter 4), the benefits of physical activity (Chapters 4 and 5), and behavioural change and motivational interviewing techniques be incorporated into educational content (Chapter 4). When instigating training interventions, assessing their influence on podiatrist assessment and promotional behaviours, podiatrist and patient perceptions, as well as the effects on patient physical activity levels is warranted.

Study limitations and strengths

There were some potential limitations that should be considered when interpreting the findings of this thesis. Firstly, convenience sampling may limit generalising the findings. Podiatrists who value physical activity and physical activity promotion may have been more likely to be involved with the study, while those who do not believe physical activity promotion is within their scope of practice may have chosen not to participate. However, the samples obtained were broad and fairly representative of the populations under study. In addition, findings were consistent across the studies and similar in nature to those from other non-medical health professions.

Secondly, the use of self-report instruments to collect data may have been prone to responder bias. This may have led to more favorable reporting of physical activity promotion behaviours, particularly with socially acceptable behaviors such as physical activity promotion. In addition, it may be difficult for podiatrists to accurately recall their promotional behaviours. However, findings were congruent and yielded comparable data across studies that resulted in reaching similar conclusions. Furthermore, there was a wide variation in participant reports of physical activity promotion behaviours and potential influencing factors. Nonetheless, further studies may consider use of objective measures of physical activity promotion behaviours, such as medical record audits, audio tape or direct observation, to collect and confirm data.

Thirdly, the psychometric properties of the questionnaire items created for this thesis are unknown. Where possible, pre-existing questions were used either in their original form or adapted for the podiatry setting. Again, the consistency of findings across qualitative, quantitative and systematic

review studies suggest that the measures used were appropriate. Further studies that test the psychometric properties of these questions are warranted.

Lastly, due to the cross-sectional nature of the studies, causality or changes over time cannot be determined. Further longitudinal studies are recommended to establish, for example, the causal relationship between factors and physical activity promotion behaviours and should also the influence of past behaviour or habit on future behaviour (Conner et al. 1998).

The Theory of Planned Behaviour (TPB) guided this study and provided insight regarding podiatrists' physical activity intention and behaviours. There are, however, some limitations of the use of behavioural change theories such as the TPB including the emphasis on individual behaviour and a disregard for the influence of environmental or economic factors on behaviour and exclusion of other variables that may factor into behavioural intention and motivation. Nonetheless, the TPB appears to be an appropriate theory to study podiatrists' clinical behaviours yielding practical findings for use in developing and assessment of future interventions and strategies.

The main strengths of this thesis lie in the use of mixed methods to collect data from over five hundred podiatrists and patients. Integration and synthesis of the data contributes different perspectives providing a more comprehensive understanding of physical activity promotion in podiatry. Such knowledge is valuable for future direction in maximising effectiveness of podiatrists' physical activity promotion efforts. The information gained from these studies will be of benefit in the development of further studies and strategies to improve the efficacy of physical activity promotion in the podiatry setting. It provides a rich data set that brings new knowledge and awareness to clinical behaviour that may otherwise have gone unnoticed or unencountered.

Conclusion

This comprehensive examination of the promotion of physical activity in podiatry has revealed a viable and a unique setting that provides much scope and opportunity to improve the health and wellbeing of patients. Podiatrists generally engage and are confident in carrying out rudimentary physical activity promotion tasks, but less often take on more complex and time-consuming activities. Most podiatrists recognise their role in physical activity promotion, have a positive attitude towards it, and are confident in their ability to promote physical activity. However, some podiatrists are resistant to engage in the promotion of physical activity, which may be due to

negative attitudes and/or a lack of confidence and skills. Patients also support the role of podiatrists in physical activity promotion and are mostly satisfied with the advice they receive. Identifying effective strategies for increasing physical activity promotion among podiatrists is the next important step. This may include training and education, organisational support, and the development of effective and efficient procedures that can be easily integrated into the podiatry setting. Providing podiatrists with the skills, support and resources to effectively promote physical activity may be a feasible method for improving the future health and wellbeing of patients.

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Appendices

Appendix 1.1: Physical activity and exercise intensity terminology

Intensity category	Objective measures	Subjective measures	Descriptive measures
SEDENTARY	< 1.6 METs < 40% HR_{max} < 20% HRR < 20% VO_{2max}	RPE (C): < 8 RPE (C-R): < 1	• activities that usually involve sitting or lying and that have little additional movement and a low energy requirement
LIGHT	1.6 < 3 METs 40 < 55% HR_{max} 20 < 40% HRR 20 < 40% VO_{2max}	RPE (C): 8-10 RPE (C-R): 1-2	• an aerobic activity that does not cause a noticeable change in breathing rate • an intensity that can be sustained for at least 60 minutes
MODERATE	3 < 6 METs 55 < 70% HR_{max} 40 < 60% HRR 40 < 60% VO_{2max}	RPE (C): 11-13 RPE (C-R): 3-4	• an aerobic activity that is able to be conducted whilst maintaining a conversation uninterupted • an intensity that may last between 30 and 60 minutes
VIGOROUS	6 < 9 METs 70 < 90% HR_{max} 60 < 85% HRR 60 < 85% VO_{2max}	RPE (C): 14-16 RPE (C-R): 5-6	• an aerobic activity in which a conversation generally cannot be maintained uninterupted • an intensity that may last up to about 30 minutes
HIGH	≥ 9 METs ≥ 90% HR_{max} ≥ 85% HRR ≥ 85% VO_{2max}	RPE (C): ≥ 17 RPE (C-R): ≥ 7	• an intensity that generally cannot be sustained for longer than about 10 minutes

Categories of exercise intensity and the subjective and objective measures [both absolute and relative] accompanying each category. The relative intensity measures such as % HR max, %HRR [heart rate reserve = HR max−resting HR] and %VO2max [maximal oxygen uptake] will not always correspond to the same RPE among individuals nor will the ability of clients to exercise for a specific duration at each intensity since this varies depending on training status and other personal characteristics.

Source: Norton, K., L. Norton, and D. Sadgrove. 2010. 'Position statement on physical activity and exercise intensity terminology', Journal of Science and Medicine in Sport, 13: 496-502.

Appendix 1.2: International and national physical activity guidelines for Adults (18-64)

United States of America

Avoid Inactivity

Some physical activity is better than none — and any amount has health benefits.

Do Aerobic Activity

For substantial health benefits, do one of the following:

- 150 minutes (2 hours and 30 minutes) each week of moderate-intensity aerobic physical activity (such as brisk walking or tennis)
- 75 minutes (1 hour and 15 minutes) each week of vigorous-intensity aerobic physical activity (such as jogging or swimming laps)
- An equivalent combination of moderate- and vigorous-intensity aerobic physical activity

Do aerobic physical activity in episodes of at least 10 minutes and, if possible, spread it out through the week.

For even greater health benefits, do one of the following:

- Increase moderate-intensity aerobic physical activity to 300 minutes (5 hours) each week
- Increase vigorous-intensity aerobic physical activity for 150 minutes (2 hours and 30 minutes) each week

Doing more will lead to even greater health benefits.

Strengthen Muscles

Do muscle-strengthening activities (such as lifting weights or using resistance bands) that are moderate or high intensity and involve all major muscle groups on 2 or more days a week

Guidelines that Are the Same for Adults and Older Adults

Guidelines Just for Older Adults

- When older adults cannot do 150 minutes of moderate-intensity aerobic activity a week because of chronic conditions, they should be as physically active as their abilities and conditions allow
- Older adults should do exercises that maintain or improve balance if they are at risk of falling
- Older adults should determine their level of effort for physical activity relative to their level of fitness
- Older adults with chronic conditions should understand whether and how their conditions affect their ability to do regular physical activity safely

Canada

To achieve health benefits, adults aged 18-64 should accumulate at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week, in bouts of 10 minutes or more.

It is also beneficial to add muscle and bone strengthening activities using major muscle groups, at least 2 days per week.

More physical activity provides greater health benefits.

World Health Organisation

- Adults aged 18–64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.
- Aerobic activity should be performed in bouts of at least 10 minutes duration.
- For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity.
- Muscle-strengthening activities should be done involving major muscle groups on 2 or more days a week.

United Kingdom

1. Adults should aim to be active daily. Over a week, activity should add up to at least 150 minutes (2½ hours) of moderate intensity activity in bouts of 10 minutes or more – one way to approach this is to do 30 minutes on at least 5 days a week.

2. Alternatively, comparable benefits can be achieved through 75 minutes of vigorous intensity activity spread across the week or combinations of moderate and vigorous intensity activity.

3. Adults should also undertake physical activity to improve muscle strength on at least two days a week.

4. All adults should minimise the amount of time spent being sedentary (sitting) for extended periods.

Australia's Physical Activity & Sedentary Behaviour Guidelines for Adults

- Doing any physical activity is better than doing none. If you currently do no physical activity, start by doing some, and gradually build up to the recommended amount.
- Be active on most, preferably all, days every week.
- Accumulate 150 to 300 minutes (2 ½ to 5 hours) of moderate intensity physical activity or 75 to 150 minutes (1 ¼ to 2 ½ hours) of vigorous intensity physical activity, or an equivalent combination of both moderate and vigorous activities, each week.

- Do muscle strengthening activities on at least 2 days each week.
- Minimise the amount of time spent in prolonged sitting.
- Break up long periods of sitting as often as possible.

Appendix 3.1: Systematic review search details

Search Dates

PubMed: 1946 - September 2016

CINAHL: 1937 - September 2016

Web of Science core collection: 1945 - September 2016

PsycINFO: 1806 - September 2016

Embase: 1974 - September 2016

Search Terms

(physical activity OR exercise) AND (counseling OR counselling OR promotion) AND (allied health OR chiropractor OR dentist OR dietitian OR dietician OR diabetic educator OR exercise physiologist OR healthcare practitioner OR health care provider OR health care professional OR nurse OR nurse practitioner OR practice nurse OR occupational therapist OR optometrist OR osteopath OR pharmacist OR physician assistant OR medical assistant OR physiotherapist OR podiatrist OR psychologist)

Individual database search terms

PubMed

((((("counselling"[All Fields] OR "counseling"[MeSH Terms] OR "counseling"[All Fields]) OR ("counselling"[All Fields] OR "counseling"[MeSH Terms] OR "counseling"[All Fields]) OR promotion[All Fields]) AND ("physical activity"[All Fields] OR ("exercise"[MeSH Terms] OR "exercise"[All Fields]))) AND ("allied health"[All Fields] OR chiropractor[All Fields] OR ("dentists"[MeSH Terms] OR "dentists"[All Fields] OR "dentist"[All Fields]) OR dietitian[All Fields] OR dietician[All Fields] OR "diabetic educator"[All Fields] OR (("exercise"[MeSH Terms] OR "exercise"[All Fields]) AND ("Physiologist"[Journal] OR "physiologist"[All Fields])) OR "healthcare practitioner"[All Fields] OR "health care provider"[All Fields] OR "health care professional"[All Fields] OR ("nurses"[MeSH Terms] OR "nurses"[All Fields] OR "nurse"[All Fields] OR "breast feeding"[MeSH Terms] OR ("breast"[All Fields] AND "feeding"[All Fields]) OR "breast feeding"[All Fields]) OR "nurse practitioner"[All Fields] OR "practice nurse"[All Fields] OR "occupational therapist"[All Fields] OR optometrist[All Fields] OR ("osteopathic physicians"[MeSH Terms] OR ("osteopathic"[All Fields] AND "physicians"[All Fields]) OR "osteopathic physicians"[All Fields] OR "osteopath"[All Fields]) OR ("pharmacists"[MeSH Terms] OR "pharmacists"[All Fields] OR "pharmacist"[All Fields]) OR "physician assistant"[All Fields] OR "medical assistant"[All Fields] OR ("physical therapists"[MeSH Terms] OR

("physical"[All Fields] AND "therapists"[All Fields]) OR "physical therapists"[All Fields] OR "physiotherapist"[All Fields]) OR podiatrist[All Fields] OR ("psychology"[MeSH Terms] OR "psychology"[All Fields] OR "psychologist"[All Fields]))) AND Journal Article[ptyp] AND "humans"[MeSH Terms] AND English[lang] AND (Journal Article[ptyp] AND "humans"[MeSH Terms] AND English[lang])

CINAHL

(“physical activity” OR exercise) AND (counseling OR counselling OR promotion) AND (“allied health” OR chiropractor* OR dentist* OR dietitian* OR dietician* OR “diabetic educator” OR “diabetic educators” OR “exercise physiologist” OR “exercise physiologists” OR “healthcare practitioner” OR “healthcare practitioners” OR “health care provider” OR “health care providers” OR “health care professional” OR “health care professionals” OR nurse* OR “nurse practitioner” OR “nurse practitioners” OR “practice nurse” OR “practice nurses” OR “occupational therapist” OR “occupational therapists” OR optometrist* OR osteopath* OR pharmacist* OR “physician assistant” OR “physician assistants” OR “medical assistant” OR “medical assistants” OR physiotherapist* OR podiatrist* OR psychologist*)

Web of Science

Topic=(“physical activity” OR exercise) AND Topic=(counseling OR counselling OR promotion) AND Topic=(“allied health” OR chiropractor* OR dentist* OR dietitian* OR dietician* OR “diabetic educator” OR “diabetic educators” OR “exercise physiologist” OR “exercise physiologists” OR “healthcare practitioner” OR “healthcare practitioners” OR “health care provider” OR “health care providers” OR “health care professional” OR “health care professionals” OR nurse* OR “nurse practitioner” OR “nurse practitioners” OR “practice nurse” OR “practice nurses” OR “occupational therapist” OR “occupational therapists” OR optometrist* OR osteopath* OR pharmacist* OR “physician assistant” OR “physician assistants” OR “medical assistant” OR “medical assistants” OR physiotherapist* OR podiatrist* OR psychologist*)
Refined by: Document Types=(ARTICLE OR PROCEEDINGS PAPER) AND Languages=(ENGLISH)
Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC Timespan=All years

PsycINFO

("physical activity" OR exercise) AND (counseling OR counselling OR promotion) AND ("allied health" OR chiropractor* OR dentist* OR dietitian* OR dietician* OR "diabetic educator" OR "diabetic educators" OR "exercise physiologist" OR "exercise physiologists" OR "healthcare practitioner" OR

"healthcare practitioners" OR "health care provider" OR "health care providers" OR "health care professional" OR "health care professionals" OR nurse* OR "nurse practitioner" OR "nurse practitioners" OR "practice nurse" OR "practice nurses" OR "occupational therapist" OR "occupational therapists" OR optometrist* OR osteopath* OR pharmacist* OR "physician assistant" OR "physician assistants" OR "medical assistant" OR "medical assistants" OR physiotherapist* OR podiatrist* OR psychologist*) AND (po.exact("Human") AND la.exact("ENG") AND PEER(yes)) AND (rtype.exact("Journal Article" NOT ("Review-book" OR "Comment/reply" OR "Editorial" OR "Erratum/correction" OR "Letter" OR "Review-media" OR "Abstract Collection" OR "Column/opinion" OR "Reprint" OR "Review-software & Other")) AND stype.exact("Scholarly Journals"))

Embase

'counseling'/exp/mj OR 'counselling'/exp/mj OR promotion AND ('physical activity'/exp/mj OR 'exercise'/exp/mj) AND ('allied health' OR chiropractor* OR dentist* OR dietitian* OR dietician* OR 'diabetic educator' OR 'diabetic educators' OR 'exercise physiologist' OR 'exercise physiologists' OR 'healthcare practitioner'/exp/mj OR 'healthcare practitioners' OR 'health care provider'/exp/mj OR 'health care providers' OR 'health care professional'/exp/mj OR 'health care professionals' OR nurse* OR 'nurse practitioner'/exp/mj OR 'nurse practitioners'/exp/mj OR 'practice nurse' OR 'practice nurses' OR 'occupational therapist'/exp/mj OR 'occupational therapists' OR optometrist* OR osteopath* OR pharmacist* OR 'physician assistant'/exp/mj OR 'physician assistants'/exp/mj OR 'medical assistant'/exp/mj OR 'medical assistants' OR physiotherapist* OR podiatrist* OR psychologist*) AND ([article]/lim OR [article in press]/lim OR [conference abstract]/lim OR [conference paper]/lim OR [short survey]/lim) AND [humans]/lim AND [english]/lim

Appendix 3.2: Systematic review characteristics and results of included studies

Author **Year** **Country**	**Participants** **Profession** **Number** **Sex** **Female(F)/Male(M)** **Age mean (range)** **Response rate** **Setting** **Design**	**Outcome: Physical activity promotion practice (PAP)**	**Potential factors <u>significantly</u> associated with physical activity promotion practice** ***Factors <u>not significantly (NS)</u> associated with PAP***	**Quality Assessment Limitations**
Abaraogu, Edeonuh, Frantz, 2016 Eastern Nigeria (1)	Physiotherapists (PT): n=103 F/M%: 30/70 Mean Age: NR Response =73% Setting: Private and government healthcare Design: Cross-sectional	Frequency of providing PA advice; providing PA written materials; referring to other service providers (never, sometimes, usually, always).	Female physiotherapists were more likely to assess clients' PA profile routinely at initial contact (x^2= 3.984; p< 0.046). Longer clinical experience (>6 years) associated with more regular assessment of clients' PA profile during follow-up visits (x^2= 5.977; p < 0.014). Received training on strategies for helping clients change their PA behaviour were more likely to regularly assess their clients' PA profile at initial contact (x^2=6.412; p ¼ 0.011) and regularly assess their clients' readiness to change a physically inactive lifestyle (x^2= 8.628; p ¼ 0.003). Receiving training on strategies for helping clients change their PA behaviour and regularly provide their clients with written material on PA (x^2 =7.165, p< 0.007). *<u>NS:</u> Age.*	Purposive sampling Limited population description No non-responder data Measurement by self-report survey only PAP measure: Limited tests of validity Factor measure: Limited tests of validity Limited reporting of statistics No multivariable analysis
Aweto, Oligbo, Fapojuwo, Olawale, 2013 Nigeria (2)	Physiotherapists (PT): n=308 F/M%: 46/54 Mean Age: NR Response =77% Setting: Setting: Private and public hospitals	Past month frequency of encouraging patients to have a more physically active lifestyle (>10 or < 10 patients per month).	1–5 years of working experience (x^2=11.37, p=0.023). Insufficient consultation time (x^2=3.36, p=0.043). Relative PA levels of physiotherapists (x^2=11.82, p=0.037). *<u>NS:</u> Knowledge of PA message. Perceived lack of counselling skills. Feeling it would not change the patient's behaviour. Feeling it would not be beneficial for the patient. Role perception. Confidence in providing PA advice. Lack of remuneration for promoting PA. Lack of interest in promoting PA.*	Convenience sample Limited population description Limited sampling frame information No non-responder data Measurement by self-report survey only PAP measure: no references or tests of validity and reliability

	Design: Cross-sectional			Factor measure: no references or tests of validity and reliability No multivariable analysis
Bakhshi, Sun, Murrells, While, 2015 UK (3)	Nurses (N): n=623 F/M%: 89/11 Mean Age: NR Response: 84% Setting: Community or Hospital PHC, SHC, THC (Medical, Surgical, Mental health, Paediatrics, Midwifery) Design: Cross-sectional	Stages of change for health promotion practices.	Participants aged 20–29 years (x^2 =60.00, P<0.001), Caucasian (x^2 =7.20, P=0.01), Staff nurses (x^2 =5.73, P=0.02) more likely to be at the 'pre-contemplation' stage. Participants aged 20–29 years more likely to be at the 'contemplation' (x^2 =219.52, P<0.001) and 'preparation' (x^2 =954.82, P<0.001) stages. Participants who had no long-term health problems less likely to be at the 'pre-contemplation' stage than those with long-term health problems (x^2 =8.86, P=0.003).	Convenience sample No non-responder data Measurement by self-report survey only PAP measure: no tests of validity and reliability Factor measure: Limited tests of validity and reliability Adjustment for confounders unclear
Burns, Camaione, Chatterton 2000 USA (4)	Nurse practitioners (NP): n=355 F/M%: 97/3 Mean Age: 44.5 (25-74) Response: 61% Setting: Private, hospital, community (private practice (35%), hospital clinic (18%) community clinic (13%)	Whether the NP routinely counsels clients to meet the current physical activity recommendation of 30 minutes on most days (Yes/No).	Self-reported knowledge to counsel clients about PA (OR 2.01, 95% CI 1.46–2.77). Knowledge about PA other than NP program (OR 2.29 95% CI 1.22 to 3.13). NP meeting the current PA recommendation (OR 1.96, 95% CI 1.39–3.77). *NS: Holds master's degree. Self-reported knowledge to assess. Confidence to assess and counsel. Education about PA in NP program. NP's Current activity level.*	No non -responder data Measurement by self-report survey only PAP measure: no references or tests of validity Factor measure: no references or tests of validity No multivariable analysis

	Design: Cross-sectional			
Burton, Pakenham, Brown, 2010 Australia (5)	Psychologists (PSY): n=236 F/M%: 85/15 Mean Age: 42 (22-75) Response: 38% Setting: private practice (52%), community (19%), not for profit organisation (14%), education(13%) , hospital/primary care/general practice(12%), corporate/commercial(9%) Design: Cross-sectional	Activity advice and counselling during the previous month as: Frequency of discussing lifestyle behaviours; Asking about activity; Discussing activity; Recommending activity; Providing general activity advice; Doing activity counselling. Scale: not at all, rarely, sometimes, often, and most of the time. Separate principal components analyses with oblique rotation were conducted for items assessing the frequency of activity advice and counseling.	Multivariable: Regular exercise (β=2.56, p=0.003). Confidence to provide general activity advice (β=0.52, p<0.0030. Private practice context (β=1.54, p<0.04). General health and well-being client issues (β=1.92, p=0.02). Acceptability (β=0.3, p=0.02). Univariate: Undergraduate instruction in activity advice/counseling (β=2.39, P=0.04). Confidence to do activity counseling (β=0.22, p<0.001). Client burden (β=-0.49, p=0.001). Benefit for psychological well-being (β=0.27, p=0.001) or complex conditions (β=0.80, p<0.001). Being a generalist (β=2.64, p=0.02). Mental health (β=3.72, p=0.002) or personal development client issues (β=3.72, p<0.001). Trauma/harm (β=2.21, p=0.005) or addictions client issues (β=3.05, p<0.001). *NS: Age, Sex, Qualifications. Postgraduate instruction in activity advice/counseling. Attendance at workshop promoting activity advice/counseling. Benefit for physical conditions. Knowledge of moderate activity. Years in practice. Practice location. Clinical psychology specialization. Health psychology specialization. Counseling psychology specialization. Community health/mental health context. Not for profit organisation context. Education context. Hospital/primary care/GP clinic context. Corporate/commercial context. Relationship client issues. Work/community client issues.*	Limited non-responder data Measurement by self-report survey only Low response rate PAP measure: no references or tests of validity Factor measure: No tests for validity, References for Acceptability, PA levels and Knowledge of guidelines.
Dauenhauer, Podgorski, Karuza, 2006 USA (6)	Nurse practitioners (NP): n=48, Practice assistants (PrA): n=39. NPs F/M%: 98/2 PAs F/M%: 70/30 Mean Age: NR Response: NPs 51%, PAs 30% Setting: PHC Office-based NP 19%, PrA	Number of exercise prescriptions dispensed each month (no exercise prescription and one exercise prescription or more).	*NS: Beliefs that: Exercise is beneficial in preventing chronic diseases; PA yields benefits for individuals of any age; PA is not appropriate for most older adults; Primary care practitioners should be proactive in prescribing exercise for all patients; Ascertaining information on preventive health behaviours, including exercise, is an important part of patient history-taking; It is more difficult to get an older patient to exercise than a younger patient; Prescribing exercise for older adults is complex due to multiple medical conditions and medications. The Importance of exercise. Current level of PA. Days/week participate in exercise for 30 min.*	Limited non-responder data Small sample Low response rate Measurement by self-report survey only PAP measure: no references or tests of validity and reliability Factor measure: no references or tests of validity Estimates not reported (eg: OR or p value)

	56% Non-Office NP 81%, PrA 44% Design: Cross-sectional			No multivariable analysis
Esposito, E. M. Fitzpatrick, J. 2011 USA (7)	Nurses n=112 F/M%: 93/7 Mean Age: 43 (22-61) Response: NR Setting: Inpatient (64%) and outpatient (45%) in one hospital Design: Cross-sectional	Recommendation of exercise to patients (PAP); 1) for health promotion, 2) as part of their treatment plan for their condition. (1=weak to 10=strong)	Beliefs of the benefits of exercise (EBBS) and 1) PAP for health promotion (r=0.22, P=0.017), and 2) PAP as part of treatment plan (r=0.25, P=0.009). Health-Promoting Lifestyles Profile-II (HPLP-II) PA subscale and 1) PAP for health promotion (r=0.20, p=0.03) and 2) PAP as part of treatment plan (r=0.25, p=0.007).	Convenience sample No non-responder data Measurement by self-report survey only PAP measure: no references or tests of validity and reliability Response rate not reported Small sample No multivariable analysis
Faulkner, Biddle, 2001 UK (8)	Nurses: n=161 Occupational therapists: n=36 Psychologists: n=40 Psychiatric nurses: n=57 Health care support workers: n=87 Profession NR: n=13 Total: 394 F/M%: 67/33 Mean Age: 38.6 Response: 83% Setting: Rehabilitation(n=13) Community(n=99), Inpatient (n=147)	Stages of change for PAP 6 months from baseline (SOC): 1) no promotion including pre-contemplation and contemplation, 2) irregular promotion or preparation and 3) regular promotion including action and maintenance.	Irregular and regular promotion groups were more positive in attitudes than no promotion group, more likely to have perceived behavioural control (PBC) over PAP, more likely to be aware of subjective norms to PAP ($p<0.05$). Attitude ($F=13.93$, Effect size=0.07, $p<0.01$). PBC ($F=29.6$, Effect size=0.13, $p<0.01$). Subjective Norms ($F=21.98$, Effect size=0.101, $p<0.01$). Predictors of SOC at 6 months: Intention ($\lambda=0.42$, $p<0.01$); PBC ($\lambda=0.14$, $p<0.05$); After inclusion of past behaviour in model: Past behaviour ($\lambda=0.30$, $p<0.01$); Intention ($\lambda=0.23$, $p<0.01$). *NS: Predictors of SOC: PBC.*	Limited population description Limited information about sampling frame and screening criteria No non-responder data Measurement by self-report survey only PAP measure: no tests of validity and reliability

	Design: Prospective			
Florindo, Mielke Gomes, Ramos, Bracco, Parra, Simoes, Lobelo, Hallal, 2013 Brazil (9)	Nurses: n=347 F/M%: 85/15 Mean Age: 32.6 Response: 65.1% Setting: Community primary healthcare units Design: Cross-sectional	Stages of change for PAP. Providers reporting regularly recommending PA for over 6 months were considered to provide counseling to patients. (SOC).	Multivariable: Performing PA assessment (OR 2.14 95% CI 1.31-3.49). Feels prepared to advise patients on PA (OR 2.62 95% CI 1.54-4.44); Health care unit has PA programs for patients (OR 2.46 95% CI 1.45-4.20). *NS: Thinks lack of time is a barrier. Self-rated knowledge on the recommendations of PA for health. Knowledge on the recommendations for moderate-intensity PA or vigorous-intensity PA. Opinion on the possibility of combining moderate and vigorous-intensity PA for achieving health guidelines. Considers it feasible or a priority that PA programs are offered in your health care unit. Considers lack of knowledge a barrier to PA counseling, Lack of places for PA practice is a barrier to PAP, Importance of PA programs in primary health care settings, Physical Education professionals should be the main professional responsible for PAP in primary health care settings.*	No non-responder data Measurement by self-report survey only Limited factor descriptions PAP measure: no references or tests of validity and reliability Factor measure: no references or tests of validity and reliability
Frantz, Ngambare, 2013 Rwanda (10)	Physiotherapists: n=92 F/M%: 30/70 Mean Age: 32.5 (26-60) Response: 88.5% Setting: Referral and district hospitals Design: Cross-sectional	Physical Activity Exit Interview which measures the content of PAP counselling in clinical practice (high, moderate, poor).	Age < 35 years (51%). Males (46%) > females (20%). *NS: Physical activity level (GPAQ).*	No non-responder data Measurement by self-report survey only Limited reporting of statistics No multivariable analysis
Huijg, Dusseldorp, Gebhardt, Verheijden, van der Zouwe, Middelkoop, Duijzer, Crone, 2015	Physiotherapists n =268 F/M%: 58/42 Mean Age: 39.8 Response: 55.2% Setting: Physiotherapy practice or multidisciplinary health care centre	Completeness of delivery measured by amount of patients receiving tasks including intervention components: Intake, Training program, Evaluation, Maintenance and Contact with referring professional (l=none, 2=a few, 3 = less than half, 4 =	Multivariable: Beliefs about capabilities (β=0.32, p<0.000) Univariate: Knowledge (β=0.20, p=0.005), Skills (β=0.17, p<0.000), Social/professional role and identity (β=0.13, p=0.003), Beliefs about capabilities (β=0.43, p=0.001), Beliefs about consequences (β=0.26, p<0.000), Intentions (β=0.14, p<0.000), Goals/priority (β=0.09, p=0.014), Innovation characteristics (β=0.14, p=0.006), Organizational resources and support (β=0.9, p=0.033), Patient motivated/positive towards intervention (β=0.11, p=0.022), Social influences (β=1.6, p=0.001), Positive emotions (β=1.7, p=0.30???), Behavioural regulation (planning) (β=033, p<0.000), Nature of the behaviours (memory and automaticity) (β=0.19, P<0.000). *NS: Sex, age, practice demographics, Optimism, Sociopolitical context, negative emotions.*	Convenience sample Measurement by self-report survey only PAP measure: Limited tests of validity Factor measure: limited tests of validity

Netherlands (11)	Design: Cross-sectional	half, 5= more than half, 6=almost all, and 7=all).		
Hurkmans de Gucht, Maes, Peeters, Ronday, Vliet Vlieland, 2011 (12)	Nurses (N): n=132 Physiotherapists (PTs): n=112 N's F/M%: 95/5 PT's F/M%: 56/44 N's Mean Age: 45 PT's Mean Age: 45 N's Response: 56%, PTs Response: 53% Setting: Hospital (83%), Private practice(65%), Other (37%) Design: Cross-sectional	1) Advising patients to take care of regular PA, 2) Advising patients with recent onset rheumatoid arthritis (RA) to take care of regular PA, 3) Advising patients with established RA to take care of regular physical PA, 4) Advising patients about PA using the Dutch public health recommendation. (always, regularly, sometimes, never)	PTs level of physical activity (SQUASH) and the frequency of PA advice to RA patients (r=0.323, p=0.001). *NS: Age, sex.*	No non-responder data Data collection by survey only PAP measurement: no references or tests of validity Factor measurement: no references or tests of validity Limited data reporting No multivariable analysis
Johnson, Bates, Fitzpatrick Marshall, Bell, McCargar, 2007 Canada (13)	Dieticians: 103 F/M%: 99/1 Mean Age: 38 Response: 19.1% Setting: NR Design: Cross-sectional	Counselling strategies related to PA/active living: Active living strategies based on stage of change; Incorporated active living tools (i.e. activity diary), Developed active living care plan, Incorporated Canada's Physical Activity Guide, Recommend PA tools (i.e. pedometers), Referral to PA professional. (never, some of	Attending an active living workshop was associated with more refers to PA professionals (x^2=12.68, P<0.05). *NS: Attending workshop was not associated with: Assessing readiness for active living; Active living strategies based on stage of change; Incorporating active living tools; Developed active living care plan; Incorporating Canada's Physical Activity Guide; Recommended PA tools (i.e. pedometer).*	Convenience sample No non-responder data Measurement by self-report survey only Low response rate PAP measure: no references or tests of validity and reliability No multivariable analysis

		the time, most of the time, always)		
Karvinen, McGourty, Parent, Walker, 2012 USA (14)	Oncology nurses (ON): n=274/ F/M%: 98/2 Mean Age: 48.3 Response: 13.8% Setting: Chemotherapy(18.4 %), Research(8.7%), Radiation(5%), Bone marrow transplantation(4.3 %), Surgical(2.7%), Other(20%) Design: Cross-sectional	''What percentage of on-treatment patients and post-treatment patients do you provide physical activity recommendations to when it is appropriate to do so" (0% = none, 100% = all?).	Multivariable: Factors associated with on-treatment PAP: Belief in benefit of PA to; improve ability to do daily tasks (β=0.21, P<0.001), to help patients cope (β=0.20, p=0.001; Unsure what kind of PA to recommend (β=-0.17, p =0.016), and that PA is safe for patients (β=-0.17, p=0.015). Factors associated with post-treatment PAP: Lack of time (β=-0.14, P=0.021); unsure what PA to recommend (β=-0.24, p<0.001). Univariate: Factors associated with on-treatment PAP; Belief in benefit of PA to: reduce risk of other disease associated (r=0.16, p<0.05); improve mental health (r=0.24, p<0.01); attenuate physical declines (r=0.29, p<0.01); to help patients cope (r=0.28, p<0.01). Not sure that PA can help (r=-0.25, p<0.01). Belief that patients not interested (r=-0.09, p<0.05). PA counseling not reimbursed (r=-0.14, p<0.05). Factors associated with post-treatment PAP: ON's age (p=0.027). Belief in benefit of PA to: improve ability to: do daily tasks (r=0.22, p<0.01); reduce risk of other disease (r=0.13, P<0.05); improve mental health (r=0.19, P<0.05); attenuate physical declines (r=0.16, p<0.05). Unsure that PA is safe (r=-0.26, p<0.01). Not sure that PA can help (r=-0.26, p<0.01). *NS: Factors not associated with on-treatment PAP: ON's number of years practicing, ethnicity, own PA levels; Belief in benefit of PA to reduce risk of recurrence; Lack of time.* *Factors not associated with post-treatment PAP: Patients not interested. PA counseling not reimbursed.*	No non-responder data Measurement by self-report survey only Low response rate PAP measure: no references or tests of validity and reliability Factor measure: Limited references and no tests of validity and reliability Adjustment for confounders unclear
Karvinen, Bruner, Truant, 2015 USA (15)	Oncology nurses (ON): n=314 F/M%: 98**/2** Mean Age: 47.7 Response: 8% Setting: Chemotherapy(72%) , Radiation(32%), Bone marrow transplantation(15%), Surgical(21%), Other(25%)	Lifestyle behaviour counseling: % patients with cancer on active treatment and post-treatment providing guidance or advice to concerning PA, Minutes on average spent speaking to patients about PA.	Training on providing PA counseling more likely to provide PA counseling to a greater % of patients, compared to those who had not received training (t[256] = 2.85, p = 0.005). *NS: Moderate to vigorous PA, Fruit and vegetable intake, smoking, PA counseling practices between American and Canadian participants.*	Convenience sample No non-responder data Measurement by self-report survey only Low response rate PAP measure: no tests of validity and reliability Factor measure: no tests of validity and reliability No multivariable analysis

	Design: Cross-sectional			
Lamarche, Vallance, 2013 Canada (16)	Nurse practitioners: n=148 F/M%: 97/3 Mean Age: NR Response: NR Setting: NR Design: Cross-sectional	1) Frequency of prescribing: % of current patients to whom they prescribed PA.	Frequency of prescribing was associated with perceived competence in (r=0.24, p=0.003) and importance of (r=0.18, p=0.032) PAP.	Convenience sample No non-responder data Measurement by self-report survey only Limited sampling frame information Response rate not reported Limited definition of PAP measure: no tests of validity and reliability Factor measurement: no tests of validity or reliability No multivariable analysis
Laws, Kirby, Davies, Williams, Jayasinghe, Amoroso, Harris, 2008 Australia (17)	Registered Nurse: n=40, Enrolled nurse: n=10, Allied health: n= 9. F/M%: 93/7 Mean age: NR Response: 97% Setting: Primary health care	Proportion of new and review clients seen over the past 2 weeks and; Asking about PA, Giving verbal or written advice about PA, Referring to other services for support in changing PA, Time discussing PA, Follow up progress with PA.	Multivariable: Perceived client acceptability associated with asking new clients about PA (OR: 9.7 95% CI 1.4-65.7, p<0.05). Perceived client acceptability associated with giving verbal advice about PA (OR: 17.6 95% CI 1.6-189.5, p<0.05). Univariate: Confidence in assessing PA (OR 4.7 95% CI 1.5-14.9, p<0.001) and confidence in discussing PA recommendations (OR 7.6 95% CI 2.2-26.4, p<0.001) associated with asking new clients about PA. Confidence in discussing PA recommendations (OR 5.2 95% CI 1.6-16.4, p<0.001) and work priority (OR 9.2 95% CI 2-41.7, p<0.001) associated with time discussing PA. Knowledge of PA assessment associated with follow up progress with PA (OR 12.5 95% CI 2.4–64.0, p<0.001).	Convenience sample Small sample Data collection by survey only Limited definitions of factors and outcomes PAP measure: no tests of validity and reliability Factor measure: no tests of validity and reliability

	community health teams Design: Cross-sectional			
McDowell, McKenna, Naylor, 1997 UK (18)	Practice nurses: n= 196. F/M%: 100/0 Mean Age: 43.6 Response: 72.1% Setting: general practice Design: Cross-sectional	Stages of change for PAP (SOC) (Restricted promoting - Precontemplation, Contemplation, Preparation, Relapse and Promoting – Action and Maintenance). Frequency for PAP for new, established, targeted patients, or handing pamphlets or follow up by telephones.	Recording patient information (U=1664.5, p<0.01). Hours of training in the past 5 years (U=1584.5, p<0.01). Lack of protocols (U=993.0, p<0.05). Asking established patients about PA habits (U=1439 .0, p<0.01). Frequency of follow up of New (U=1515.0, p<0.05), Established (U=1334.0, p<0.01) and Targeted U=1041.5, p<0.01) patients. Frequency of handing pamphlets to targeted patients (U=1211.0, p<0.05). SOC for own PA, (r=0.26, p<0.001). *NS: Age. Years as a PN. Practice Demographics: Number of GPs or PNs. Total patient list. Knowledge of risk factors. Lack of time, success, resources, incentives. Asking patients with either Diabetes, 2x Chronic diseases, Overweight, Hypertension, Arthritis, Depression about PA habits. Asking new patients about PA habits. Frequency of handing pamphlets to new or established patients. Follow-up of new, established or targeted patients using phone.*	Limited population description No non-responder data Measurement by self-report survey only PAP measure: no tests of validity and reliability Factor measures: limited definition, no references or tests of validity and reliability No multivariable analysis
McElwaine, Freund, Campbell, Knight, Bowman, Wolfenden, McElduff, Bartlem, Gillham, Wiggers, 2014 Australia (19)	Nurses and Allied health n=570 F/M%: NR Response: NR Setting: Primary healthcare facilities Design: RCT	Effectiveness of a multi-strategy practice change intervention (intervention versus control). Receipt of Brief advice: Clients were asked whether the clinician advised them to do more physical activity (yes, no, or don't know). Referral/follow-up: Clients were asked whether they had received various forms of referral or follow-up (yes, no, don't know).	Increase in clients reporting clinician assessment of physical activity at baseline and at follow-up (+11.1%, OR: 1.79). *NS: Increase in clients reporting clinician provision of Brief advice, Referral/Follow-up regarding physical activity.*	Non-randomised control No non-responder data Measurement by telephone interviews only PAP measure: no references or tests of validity and reliability Exposure measurement: no tests of validity or reliability Limited intervention information Lack of control for study design No multivariable analysis
McEntee, Halgin, 1996	Psychotherapists: n=101. F/M%: 49/51.	1) Discuss exercise with clients in general	Male therapists more likely to discuss exercise with male Vs female clients, (x^2= 8.12, p<0.05). Beliefs that exercise is beneficial to psychological functioning more likely to include exercise as treatment recommendation with vignette patient (r=0.50, p<0.001).	No non-responder data Measurement by self-report survey only

USA (20)	Mean Age: 48.5 Response: 44% Setting: Private practice(77%), hospital(8%), outpatient private clinic(6%), university-affiliated psychological services center(5%), community mental health center(2%), and health maintenance organization(2%), other setting(6%) Design: Cross-sectional	2) Likelihood of addressing the issue of exercise in their treatment of a hypothetical patient vignette.	Exercising therapists were more likely to: raise the issue of exercise with their clients (x^2 =12.44, p<0.005), more likely to discuss exercise with their clients in general (x^2 =9.10, p<0.05) and more likely to addresses the issue of exercise with vignette patient (x^2=15.55, p<0.05).	Limited definitions of factors and PAP PAP measure: no references or tests of validity and reliability Factor measure: no references or tests of validity and reliability No multivariable analysis
McKenna, Naylor, McDowell, 1998. UK (21)	Practice nurses: n= 121. F/M%: 100/0. Mean Age: 43.6 Response: 72% Setting: General practice Design: Cross-sectional	Stages of change for PAP (Pre-active: Precontemplation, Contemplation, and Preparation; and Action: Action and Maintenance)	Duration of consultation time (OR 1.61 CI 1.02 to 1.62 p=0.01). Regular personal exercise (OR 4.77 CI 1.48 to 15.35 p=0.008). *<u>NS:</u> Perceived lack of success. Lack of time. Lack of resources. Lack of protocols. Lack of incentives*	No non-responder data Measurement by self-report survey only Factor measure: limited references and no tests of validity and reliability
McKenna, Henderson, Baic, 2004 UK	Dieticians: n=397. F/M%: 94/6 Mean Age: 33.9 Response: 77%	1) PA advice to patients (Yes/No), 2) Minutes spent discussing PA in a consultation,	Exposure to PA-training was negatively associated with referring patients to a GP or physiotherapist (p<0.05). Recent behaviour change training was positively associated with GP referrals (p<0.01). Promotional efforts were higher when caseload was dominated by diabetic patients (p<0.01). Asking about patients levels of PA and advising about PA (both p<0.05) were associated with promotional efforts. Caseload was associated with promotional efforts.	No non-responder data Measurement by self-report survey only Factor and PAP description unclear

(22)	Setting: Numerous settings in teaching hospitals Design: Cross-sectional	3) Referral to a GP or physiotherapist for PA advice.	*NS: Personal PA behaviour*	PAP measure: no references or tests of validity and reliability Factor measure: no references or tests of validity and reliability No multivariable analysis
Mouton, Mugnier, Demoulin, Cloes, 2014 Belgium (23)	Physiotherapists (PT): n= 185 F/M%: 34/66 Mean Age: 39.9 Response: 56% Setting: Private practice (n = 113), hospitals (n = 68), and nursing homes (n = 21) Design: Cross-sectional	Self–reported PA promotion score: 1) Agreement with "PT must contribute to PA promotion in patients" (strongly agree, agree, disagree, or strongly disagree). 2) an open-ended question, PTs were asked to provide a comprehensive description of their self-reported PA promotion for patients.	Knowledge of definition of physical activity ($r = 0.251$, $p < 0.001$), Beliefs about benefits of regular PA ($r = 0.180$ $p<0.014$), Knowledge, attitudes, and beliefs about PA global score ($r= 0.213$, $p<0.004$). *NS: Beliefs about: The dimensions of PA, Physical manifestation of effective PA, PA recommendations for adults or children.*	Convenience sample No non-responder data Measurement by self-report survey only PAP measure: tests of validity Factor measure: limited references or tests of validity and reliability Mutlivariable model unclear
Mullen, Holcomb, 1990 USA (24)	Dental hygienists (DH): n=90 Registered dieticians (RD): n=262 Certified nurse-midwives (CNM): n=143 F/M: NR Mean Age: NR Response: DH 36%, RD 52%, CNM 57% Setting: NR	Extent that health professional counsels patients about exercise.	Multivariable: Professional group (R^2=0.26, $p<0.05$). Self-efficacy hierarchical model (R^2=0.13, $p<0.05$). Adherence expectation (R^2=0.02, $p<0.05$). Expectation of Health impact (R^2=0.04, $p<0.05$*)* Univariate: CNM and RD did significantly more exercise counselling compared to DH [CNM: 3.60 (SD 1.05), RD: 3.60 (SD 1.23), DHs: 2.00 (SD 0.94), $p<0.05$]. Self-efficacy of CNM ($r=0.41$, $p<0.02$), RD ($r=0.44$, $p<0.02$), DH ($r=0.35$, $p<0.02$); Adherence expectation of CNM ($r=0.31$, $p<0.02$), RD ($r=0.33$, $p<0.02$). Expectation of health impact of CNM ($r=0.47$, $p<0.02$), RD ($r=0.31$, $p<0.02$). *NS: Adherence expectation or expectation of health impact of DH.*	No non-responder data Measurement by self-report survey only Limited population description PAP measure: no tests of reliability Factor measure: no tests of reliability Limited adjustment for confounders

	Design: Cross-sectional			
Rea, Marshak, Neish, Davis, 2004 USA (25)	Physiotherapists: (PT): n=417 F/M%: 77/23. Mean Age: 38.9 Response: 12% Setting: Inpatient (26%), Outpatient (52%), Home health(15%), School system(7%) Design: Cross-sectional	Percentage of time (0%–100%) PT assisted patients with increasing cardiovascular fitness for overall health benefits.	Multivariable: Self-efficacy expectation (r=0.246, p<0.000007). *NS: Outcome expectation.*	No non-responder data Measurement by self-report survey only Low response rate Limited definition of factors PAP measure: no references or tests of validity and reliability Factor measure: no references or tests of validity and reliability
Robbins, 2004 USA (26)	Nurse practitioners: n=309. F/M%: 96/4. Mean Age: 41.0 Response= 52% Setting: Community clinic(14.6%), Long-term care(7.8%), Hospital clinic(7.8%), Occupational clinic(2.9%), Private practice(47.9%), Walk-in/intermediate(3.2%), Emergency room(2.3%), Hospital(5.2%),	Percentage of patients assessed or counselled about PA.	*NS: Personal PA behaviour.*	No non-responder data Measurement by self-report survey only PAP measure: no tests of validity and reliability Factor measure: no tests of validity and reliability Limited statistical testing and reporting No multivariable analysis

	Corrections(1.6%), Other(6.8%) Design: Cross-sectional			
Sassen, KOK, Vanhees 2011, Netherlands (27)	Physiotherapists and Nurses: n=278 F/M%: 73/27 Mean Age: 36.2 Response: Time 1 77%, Time 2 35% Setting: NR Design: Prospective	1) 'Do you encourage cardiovascular patients to become physically active? 2) 'In the past month, how many of your cardiovascular patients did you encourage to become physically active?	Correlations between self-reported behaviour and; intention (r=0.44, p< .001,), attitude (r=-27, p < .001), perceived behavioural control (r=0.28, p<0.001), subjective norm (r=0.25), descriptive norm (r=0.29, p<0.001), habit (r=0.30, p<0.001), barriers (r=-0.40, p<0.001). *NS: Moral norm. Intention predicted by attitude (b=0.443, p<0.001), subjective norms (b=0.201, p<0.001), and perceived behavioural control (b=0.137, p<0.05). Self-reported behaviour predicted by intention (b=0.311, p <0.001), habit (b=0.163, p<0.01) and barriers (b=-239, p<0.001).*	No non-responder data Measurement by self-report survey only Limited sampling frame information PAP measure: no tests of validity Factor measure: no tests of validity
Shirley, van der Ploeg, Bauman, 2010 Australia (28)	Physiotherapists (PT): n=319 F/M%: 73/27. Mean Age: NR Response: 54% Setting: Private practice(57%), Other NR Design: Cross-sectional	Past month frequency of encouraging patients to have a more physically active lifestyle (>10 or < 10 patients per month).	Confidence in suggesting PA programs (OR=2.48, 1.03–5.99, p<0.05). Lack of time as a barrier (OR=0.32, 0.18–0.57, p< 0.05). Feeling it would not change the patient's behaviour (OR=0.25, 0.11–0.56, p<0.05). Belief about feasibility of using: brief PAP integrated into regular consultations (OR=3.65, 1.29–10.31, p<0.05); separate one-on-one PAP consultations (OR=3.25, 1.98–5.32 p<0.05); group PAP sessions (OR=1.69, 1.05–2.72, p<0.05). Knowledge: Several short walks of 10 minutes each on most days is better than one round of golf per week for good health was associated with counseling, (OR 1.83 (1.05–3.17), p<0.05). *NS: Knowledge of the PA message (3 questions) and aware of PA guidelines. Perceived lack of counselling skills. Discussing benefits of a PA is part of role. Suggesting ways to increase daily PA is part of role. Being a role model. Confidence in giving general advice. Lack of remuneration. Feeling it would not be beneficial for the patient. Belief about feasibility of distribution of PAP resources (eg, brochures). Personal PA behaviour.*	Measurement by self-report survey only PAP measure: no tests of validity and reliability Factor measure: no tests of validity and reliability
Stanton, Happell, Reaburn, 2015 Australia (29)	Nurses n=34 F/M%: 100/0 Mean Age: 42.8 Response: NR Setting: inpatient mental health facilities	Frequency of exercise prescription: "Do you prescribe exercise to people with a mental illness?" ('never', 'occasionally', 'most of the time', 'always').	*NS: Frequency of exercise prescription and self-reported PA (IPAQ-SF).*	Convenience sample Small sample No non-responder data Measurement by self-report survey only Limited sampling information Response rate not reported

	Design: Cross-sectional			PAP measure: no references and limited tests of validity and reliability No multivariable analysis
Wendt, 2005. USA (30)	Psychologists: n=174. F/M%: 56/41. Mean Age: 51.8 Response: 34.8% Setting: Private practice office, Mental health agency, Medical hospital, Psychiatric hospital, Other Design: Cross-sectional	Frequency of: asking whether clients exercise; advising about risks and benefits of the behaviour and encouraging behaviour change; (1=none - 4=all).	Advising behaviour associated with: years in practice (r=0.19, p=0.01); formal training in exercise counseling (t_{170} = - 2.60, p=0.01); routinely asking new clients about exercise (r=0.44, p=0.001); having proportionately fewer sedentary clients (r=-0.20, p=0.02); having greater frequency of clients who initiate discussion about exercise (r=0.26, p=0.001); a belief that exercise was not related to psychological functioning (r=-0.24, P<0.01); a belief that counseling will help clients behaviour (r=0.24, p<0.05). Asking behaviour associated with: formal training in exercise counseling ($t_{8.43}$ = 22.79, p=0.02); Confidence in their exercise counseling ability (OR 0.47, p=0.008); having a belief that exercise is a personal choice that should not be dealt with in psychotherapy (OR=0.39; CI, .17–.92; p = 0.031); theoretical orientation (CBT vs a psychodynamic orientation) ($F_{2, 168}$ = 3.75, p = 0.03).	Limited non-responder data Measurement by self-report survey only Low response rate Limited definitions of factors Factor measure: no references or tests of validity and reliability PAP measure: no tests of validity and reliability Limited reporting of statistics

* CI: Confidence Index 95%. IPAQ-SF: International Physical Activity Questionnaire. NR: Not reported. NS: Non-significant. OR: Odds ratio. PA: Physical Activity.

PAP: Physical Activity Promotion. PHC Primary Health Care. RCT Random Control Trial

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Appendix 4.1: Podiatrist interviews invitation letter

<<Title>> <<Name>>
<<Address>>
<<City>> <<State>> <<Postcode>>

Dear <<Title>> <<Surname>>

Re: Study information: "What factors influence the physical activity promotion behaviours of Tasmanian podiatrists?"

You are invited to participate in a research study exploring the views of podiatrists about physical activity promotion in routine clinical practice.

The study is being conducted by Paul Crisford (PhD Candidate), in collaboration with Dr Verity Cleland (Postdoctoral Research Fellow), Dr Tania Winzenberg (Senior Research Fellow), and Professor Alison Venn (Menzies Research Institute Tasmania Deputy Director). The data is being collected in partial fulfilment of the requirements of a PhD for Paul Crisford under supervision by Dr Cleland, Dr Winzenberg and Professor Venn.

'What is the purpose of this study?'
The purpose of the study is to explore the views and experiences of physical activity promotion of Tasmanian podiatrists. The knowledge gained will be used in the development of further studies and may be used to inform targeted intervention strategies to enable podiatrists to effectively promote physical activity during routine clinical practice.

'Why have I been invited to participate in this study?'
You have been invited to participate in this study because you are a podiatrist practising in Tasmania. Your participation will help us gain a comprehensive picture of the role of podiatrists in physical activity promotion.

'What does this study involve?'
This study involves asking about your views on and experiences in physical activity promotion in routine clinical practice. Each interview will be conducted by a trained interviewer, will take approximately 45-60 minutes and will be digitally recorded. Preferably interviews will be carried out face-to-face at your place of practice, but if you prefer, at another venue (such as at Menzies Research Institute Tasmania) or via telephone. You will also be asked to complete a brief survey on practice and personal demographics.

'Do I have to participate?'
It is important that you understand that your involvement in this study is completely voluntary. If you do decide to participate you do not have to answer any questions you do not want to. There will be no consequences to you if you decide not to participate. If you decide to discontinue participation at any time, you may do so without providing an explanation.

'What will happen to my information?'
All information will be treated in a confidential manner, and your name will not be used in any publication arising out of the research. Hardcopies of research will be kept in a

locked cabinet at the Menzies Research Institute Tasmania and destroyed by shredding after five years. All electronic data will be kept in a separate password protected secure database, only accessible by the researchers, with a unique identifier for each participant. This data will be delated from the database after a period of five years.

What are the possible benefits from participation in this study?
Whilst there may be no direct benefit to you, this study will provide information that will give us a better understanding of the role of podiatrists in physical activity promotion. Such information may be beneficial in making improvements in the effectiveness of that role. Feedback on the outcomes of this study will be available through a summary report and through published scientific papers.

Are there any risks to participating in this study?
There are no specific risks anticipated, however, we understand that your time is valuable and we will endeavour to minimise disruption to your clinical time.

What if I have questions about this research?
If you would like to discuss any aspect of this study please feel free to contact Dr Verity Cleland on ph 6226 4603. Alternatively, you can contact us via email at Paul.Crisford@utas.ed.au. Either of us would be happy to discuss any aspect of the research with you. Once we have analysed the information we will provide you with a summary of our findings. You are welcome to contact us at that time to discuss any issue relating to the research study.

Thank you for taking the time to consider participating in this study. If you wish to take part in this study, please sign the attached consent form and return it via the pre-addressed envelope. This information sheet is for you to keep.

Yours sincerely

<<Author>>
<<Name>>
<<Author Title>>

This study has been approved by the Tasmanian Social Science Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study you should contact the Executive Officer of the HREC (Tasmania) on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote [HREC project number H12000]

Appendix 4.2: Podiatrist interviews consent form

"What factors influence the physical activity promotion behaviours of Tasmanian podiatrists?"

1. I have read and understood the 'Invitation letter' for this project.
2. The nature and possible effects of the study have been explained to me.
3. I understand that the study involves a short demographic survey and a 45-60 minute digitally recorded interview to identify the physical activity promotion knowledge, beliefs and clinical experiences of Tasmanian podiatrists.
4. I understand that participation involves the risk(s) outlined in the 'Invitation letter'.
5. I understand that all research data will be securely stored on the University of Tasmania premises for at least five years, and will then be destroyed.
6. Any questions that I have asked have been answered to my satisfaction.
7. I agree that research data gathered from me for the study may be published provided that I cannot be identified as a participant.
8. I understand that the researchers will maintain my identity confidential and that any information I supply to the researcher(s) will be used only for the purposes of the research.
9. I agree to participate in this investigation and understand that I may withdraw at any time without any effect, and if I so wish, may request that any data I have supplied to date be withdrawn from the research.

Name of Participant:

_____

If face-to-face interview:

Signature of participant: _____ Date:_____

If phone interview:

Do you have any further questions?

Do you agree to proceed with the interview?

_____

Statement by Investigator

I have explained the project & the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation

If the Investigator has not had an opportunity to talk to participants prior to them participating, the following must completed.

The participant has received the Information Sheet where my details have been provided so participants have the opportunity to contact me prior to consenting to participate in this project.

Name of investigator _____

Signature of investigator _____ Date

Appendix 4.3: Podiatrist interview schedule

"What factors influence the physical activity promotion behaviours of Tasmanian podiatrists?"

Interview Schedule

Notes

Key questions are indicated in bold and possible prompts are given in parentheses. The wording and order of the questions and the interviewer choice of prompts to use is expected to vary from interview to interview depending on ow information flows from the individual study participant.

Participant Preamble

The purpose of this study is to understand the role of podiatrists in physical activity promotion.
This is a new area of research and we are looking to compare the results of this study with existing research.
There no right or wrong answers to any questions – we are interested in your opinions. Feel free to elaborate on any of the questions I ask. Please tell me if my questions are unclear and please understand that you don't have to answer any questions that you prefer not to.

Interview Schedule

1) **What comes to mind when I mention physical activity promotion**

We are really interested in the roles and experiences of podiatrists and it is important to find out what is going on in podiatry in the way of physical activity promotion so we can build on this information for the future.

2) **What role, if any, do you think podiatrists' have in physical activity promotion?**
(If no role, why do you feel that? Both no role and yes a role prompts: Do you think podiatrists' have a role in; giving advice, assessing physical activity, giving recommendations, monitoring or following up on recommendations?)

3) **Can you tell me about how you might assess your patient's physical activity level?**
(If no, Can you explain your reasons?. If Yes; How do you decide whether or not to assess a patient's physical activity levels? Are there any groups that you are more or less likely to assess physical activity? How do you raise the issue with your patients? How would you determine a patient's physical activity level? What types of questions do you use? What things do you aim to establish?). Do you feel confident in assessing your patient's physical activity level?

4) **Do you promote physical activity to your patient?**

(If no, tell me why you don't? If yes, Tell me more / give me an example / In what situations do you promote physical activity? When do you choose not to promote physical activity?) Do you feel confident in promoting physical activity to your patients?

5) What physical activity recommendations do you make, if any?
(If none, is any particular reason why you don't. If Yes; How do you follow up your recommendations? Do you involve others in your practice in physical activity promotion, like colleagues or staff?) Do you feel confident in giving physical activity recommendations to your patients?

6) How would you document your physical activity promotion or patient's physical activity level or physical activity recommendations?

7) What other types of health promotion do you use in your clinical practice?
(For example; nutrition, weight control, smoking, stress, drug and alcohol)

We would like to hear about your thoughts on physical activity and physical activity promotion

Behavioural beliefs

8) What do you think are the benefits of physical activity?
(Do you think physical activity has a role in the prevention and management of chronic disease? .... if so, what role? How much physical activity do you think people should be doing?)

9) Are there advantages to promoting physical activity to patients?
(What are the advantages to your patient/ to you in promoting physical activity to your patients?)

10) Are there disadvantages to promoting physical activity to patients?
(What are the disadvantages to your patient/ to you in promoting physical activity to your patients?)

11) Do you think physical activity promotion works better with some patients as compared to others?

Normative beliefs

12) Are there any *others* that would influence you in the promotion of physical activity to your patients? (Are there any other groups? Other people?**)**(*Examples* of *others*; your colleagues//professional association/other health professionals/GPs/family/ friends)

13) What role do you feel these *other*s think podiatrists should have in physical activity promotion? (Prompts: Role in; giving advice, assessing physical activity, giving recommendations, referring, monitoring or following up on recommendations?)

Control Beliefs

14) What makes / would make it easier for you to promote physical activity to your patients?

15) What makes / would make it harder for you to promote physical activity to your patients?

Beliefs about confidence

I understand that it is probably hard to know whether you have been effective or not in your physical activity promotion however...

Beliefs about effectiveness(self-efficacy)

16) *Could you give me an idea about h*ow effective have you been / do you think you would be in increasing physical activity in your patients?
(Tell me more / Why or why not?)

17) Tell me about what if any physical activity promotion resources do you use?
(If so, tell me about what you have/have access to?)

18) Where would you go / or have you gone to find information or education about physical activity or physical activity promotion?

19) Before we finish today is there anything else further you would like to tell me about any of the things we've talked about today or anything we haven't discussed that you feel is important?

Thank you for your time.

Observation of physical activity promotion resources:

brochures ____ posters____ pedometers____ other_____

Appendix 4.4: Podiatrist interviews survey

BRIEF SURVEY

Please take a moment to fill out a few personal and practice details prior to your interview. This survey will be collected by the interviewer at the time of your interview.

Personal Details

Sex: M / F

Tick a box as per your age: < 25 ☐ 25–35 ☐ 35–44 ☐ 45–54 ☐ > 54 ☐

Tertiary Qualifications

_____

Educational institution/s

_____

Practice Details

1) In what kind of practice do you work? (please tick as many as are applicable)

Private practice ☐ Community based ☐ Public hospital ☐ Other _____

2) What is your area of practice? (please tick as many as are applicable)

General ☐ High risk ☐ Biomechanics ☐ Surgery ☐ Other _____

3) Approximate practice days per week _____

4) Number of years in practice _____

Your Physical Activity

The next questions are about the time you spent being physically active in the last 7 days.
They include questions about activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

In answering the following questions:

"**vigorous:** physical activities refer to activities that take hard physical effort and make you breathe much harder that normal.
"**moderate"** activities refer to activities that take moderate physical effort and make you breathe somewhat harder that normal.

1a. During the last 7 days, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?
Think about *only* those physical activities that you did for at least 10 minutes at a time.

_____ days per week

1b. How much time in total did you usually spend on one of those days doing vigorous physical activities?

_____ hours _____ minutes

2a. Again, think *only* about those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ days per week

2b. How much time in total did you usually spend on one of those days doing moderate physical activities*?*

_____ hours _____ minutes

3a. During the last 7 days, on how many days did you **walk** for at least 10 minutes at a time? This includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise or leisure.

_____ days per week

3b. How much time in total did you usually spend walking on one of those days*?*

_____ hours _____ minutes

The last question is about the time you spent sitting on weekdays while at work, at home, while doing course work and during leisure time. This includes time spent sitting at a desk, visiting friends, reading traveling on a bus or sitting or lying down to watch television.

4. During the last 7 days, how much time in total did you usually spend *sitting* on a **week day?**

____ hours _____ minutes

Thank you

Please keep this survey for collection at the time of your interview

Appendix 4.5: Podiatrist interviews supplementary quotes

Role Beliefs	
Role as a health professional	*…. being a health professional rather than just a podiatrist that looks at someone's feet ….it's definitely something where every person that the person sees, every health professional, that message should be coming across and we should be doing as much as we can (pod 11)*
Holistic approach vs focusing on an isolated problem	*We could actually include that in our more clinical side of things rather than just our conversation side of things so we can give them the more holistic approach if we know a lot more of what they're involved in and then we can help them on a lot of different levels. I think a lot of clients come to us for one thing, not realising we can help with something else. (Pod10)* *I think the fact that there is so much chronic disease around that we have to get better at making sure we see a person as a whole person and not just looking at their feet. (Pod11)*
Role in giving information, advice, education, recommendations and encouraging	*It's not to say I'm about to set up a physical activity program for anyone but sometimes you might need to help plant the seed to look at, to help someone facilitate starting off a new program or maybe even thinking about whether or not they could do exercise in a pool, not necessarily swimming. (Pod9)* *I don't sort of set goals for them or anything like that, but I say, "It would be good if you could have a walk around the block," or something like that. Or if they say that they've... they park at the car park and they walked here, well I'll say, "That's good, you know that's all good exercise." Yeah, so it's more reinforcing, you know helping what they're doing, and giving them a bit of encouragement I think. (Pod 14)*
Role in chronic disease prevention and management	*I think we've got a pretty big role, we see a lot of people who aren't active and who have developed things like Type 2 Diabetes and heart problems, and problems with mobility. (Pod 20)* *Certainly with diabetes as the epidemic that we have we, as podiatrists, have a huge role in offering preventative sort of treatments …. a lot of it is talking about physical activity and I would think that any of my colleagues would think that would be our role, to push for physical activity as a form of treatment. (Pod 7)*
Role with injury, disease or disability	*I think that generally we probably see populations that have come in with some type of injury or disease or disability, so it's part of the role is to be able to educate them of ways that they can continue physical activity while being able to accommodate that disability or injury or whatever may potentially be reducing their current physical activity. (Pod 2)*
Role limitations	
- Physical activity assessment	*I haven't ever thought about that actually. I think that would be more a role for a Physio or an Exercise Physiologist. (Pod 20)*
- Exercise prescription	*general Case Managers, so probably your General Practitioners, your Medical Specialists, maybe other Allied Health Professions are involved in physical activity prescription, like Physiotherapists probably would feel that maybe it's not so much the Podiatrist's role to specifically advise on physical activity specifically, or to specifically advise on physical activity (Pod 2)* *I think that would be more a role for a Physio or an Exercise Physiologist. (Pod12)*
- Monitoring	I would love to be able to monitor people, you know, get them to mark down how much they've done and give them a tick at the end of the time and do that sort of encouragement, but I don't know that that's our role. (Pod7) I would assume that the consensus would be that there's a role in promoting physical activity. I think that less people would probably feel that Podiatrists have a role in prescribing physical activity, which is probably fair enough. And depending on the... and probably not so much in the follow up, I think it depends on the, I guess it depends as a general sort of follow up and monitoring of physical activity and levels I think that would be expected from others. But in terms of specifically reviewing and modifying exercise programs, I think that's probably not something that's assumed that Podiatrists would do. (Pod 2)
- High risk conditions	*it depends on the person coming in really. If it's someone who's quite high risk, multiple complex issues, I think err on the safe side, and have to be a referral off to someone who is an expert in the area. (Pod13)*
Physical activity assessment practice and beliefs	
Decision to assess	
- when related to the presenting condition or affecting or affected by mobility	*….if their activity levels are affecting their foot health like if they're walking when they shouldn't be walking then I think we have a role in assessing that level of activity as well.(Pod 11)*
- dependent upon patient type	*Probably different things in different populations, so probably more in your more active population that come in with say a sporting injury, it would be to look at training loads or exercise loads, how it's distributed between different types of activities. So whether their injury may be as a result of too much of one particular type of activity. Then maybe in groups where you might be doing, say for example a diabetes assessment of neurovascular function, might be more around generally how much aerobic exercise they're doing. And then maybe in a group which maybe people have neuropathy or who are at risk... their feet are at risk, it might be more specifically looking at the type of activity that they're doing, so weight bearing activity might be more dangerous for them than others, so... and looking at whether they're doing a sufficient amount of safe activity... (Pod2)*

- during a diabetic/ neurovascular assessment	*Depends on what they're seeing me for. If they're seeing me for an injury or a diabetes assessment then that's one of our standard questions that we ask about what sort of activity levels they have….for diabetes assessment we have a form and it should be asked every time we do one of those. (Pod11)* *So it's something that I talk to all my patients with diabetes about, how much activity they're doing on a daily basis. (Pod20)* *Would probably be a middle age, over weight diabetic patient and recently diagnosed as well. (Pod1)* *And then if they come in, if they're a diabetic and coming in for a yearly check-up, well then you can check on them again. (Pod17)*
Less likely to assess	
- the elderly	*Older people... if they're coming in for a general treatment I'm not likely to assess their physical activity. I might encourage them to do more... whereas someone who's coming in with a pain in their foot condition type of thing, I'm more likely to assess them. (Pod14)* *I think the elderly is... or the aged, say those over 65 are probably a group that you assume are less active and sometimes you may not cover an accurate or detailed activity as you would with maybe more active populations that come through (Pod2)*
- When there are significant health issues and or disabilities	*maybe a little bit more complicated for us to get somebody [assessed] who is very much maybe chronically in pain that would be a quite hard. It would mean that it's not harder for your thinking and your assessment; it's just what the key priority would be at that point. And sometimes, unless you do approach somebody with that, you've obviously got to be very careful in the way that, you know the jargon and the language that you use. (Pod4)*
Assessment process	
- informal	I guess once they start talking to you and talk about their health problems, as most of them do, and I guess then you can sort of assess to sort of what level they'd be at and what they could do. That's about it. (Pod5) How I would I assess it? Just by discussion. I mean, really you can look at people… (Pod7)
- as a part of history taking	*Well we have in our forms that we fill in, you know for us it's... our safety net's always the form, so look it's our obligation to fill in this form, this is a new patient assessment. (Pod13)*
- as part of a biomechanical assessment	*I guess you do that to a certain extent, probably not a huge written report, but when you see someone, particularly the biomechanics side of it, you are actually looking at what they do, and what they can do (Pod15)*
- by observation (inferred by appearance)	*I think that's because they probably appear more frail and so it's not to say they shouldn't be, they're probably just not because they appear as though they are less active and so you make a judgement on what you think they're capable of doing. They might be capable of doing a lot more than you actually take them at face value as being able to do. (Pod12)* *…but my ongoing geriatrics would be more like me gleaning information as they walk in, as they walk out, as they move from the chair to the other chair after we get their shoes and stuff on, so it's me just watching everything happening. (Pod 16)*
Facilitators	
- Easy topic to raise with patients	*It's something that comes up easily, it's just, you know…do you walk? Because people use their feet, physical activity comes up very easily, it's not something that is hard to raise I don't think.(Pod7)*
Barriers to assessing	
- Lack of time	*depending on the actual person, the six minute walk test is... gives a pretty good indication of physical fitness for the more immobile elderly people. So depending on how far they can walk in the six minutes. This is actually not something that I've done for a long time because frankly it's something that I'm finding I don't have the time (Pod1)* *I really don't have time in my practice to set up special little sessions to assess mobility. (Pod16)*
- Lack of training and skills particularly in assessing physical fitness	*I just don't think I've got the training or the knowledge to be assessing that accurately… I don't think would ever have done that. If you specifically said, alright what clients have you assessed per their capacity? Have you measured walking distance – sit up to stand exercises or beep testing type things to measure their capacity, I've never done it as a podiatrist. I think, what I suppose I have done is looked at people and thought about, and discussed with them what activities they do, do and what their trying to achieve and if there's limitations on their ability to do that working out why that is. (Pod6)* *Well that's where it comes to a bit of a sticky point because with little training in assessing people's physical fitness, (Pod1)*
- Difficult to assess physical activity	*Sometimes… if people are retired and they don't do much then sometimes it will be gardening and bits and pieces, that's hard to figure out exactly how much activity they're doing…we try and tease that out as well if you think the activity is…(Pod10)*
- Concern about the authenticity and genuineness of patients' self-reported physical activity level	*the only way that I would know how to do that, it is just to ask them in detail, their responses really to how much their actually doing and expecting them to tell me more than is actually accurate. (Pod19)* *Sometimes it's tricky, you're trying to get people… what they say that they do as opposed to what they actually do. I start off by asking people what they do, if they go for a walk and how long they walk for or if they do any other sort of exercise. (Pod11)* *I'm amazed how people think they do a lot and they actually don't do much at all…I guess you also make a judgement call on how honest they are, you have to assume the person is being honest with you but on some of the assessments we'll do gait assessments and things like that and if people are having difficulties with that you then have to question whether they're doing the level of activity that they state that they're doing. Usually it's off that initial assessment, it's a subjective assessment where we go through and ask them a series of questions based on that. That works pretty well, most people are not going to lie because they're there for their own benefit. (Pod12)*
Physical activity promotion practice	
Recommendations tailored for individual patients dependent on:	

- age	*if we're dealing with geriatrics, we do encourage them to walk, to move around for themselves, and we create the environment that would encourage them to do that as comfortably and regularly as possible. (Pod16)* *it doesn't necessarily mean being able to run 50km but for some patients - depending on their age and stage - it could be the difference between being able to do basic general day activities because they have the strength and mobility and can stand up on two feet without falling over. It can mean different things to different people at different ages and different stages. (Pod9)*
- interests	*…helping them fulfil also what gives them joy and fulfilment in life is also a part of what is physical activity and movement (Pod16)* *matching up activities that they may have an interest in or sometimes planting the seed about joining a group of walkers, for example, or finding a buddy to help with going out and walking the dog on a regular basis. Finding something they enjoy is probably the biggest thing. It is very much an individual thing but, again, it's how you deliver the message. Is it appropriate to that patient? Have you taken the time to find out about them and what their interests are? This comes from a bit of public health background, I guess, and work around chronic disease management. It certainly is about how you do deliver that message to that person and finding out what interests them, what makes them tick, what's going to light their button to go "Oh, yeah, activity. (Pod9)*
- current physical activity levels	*So working out with people what they're doing currently and then trying to goal set with them about stuff they could be doing a bit more of or work out when they can increase activity. (Pod11)*
- physical capabilities	*It is, to talk about what they can't do and maybe what they should be doing as well. Sometimes people's expectations of what they want to do and what they think they should be doing is actually less than what they should be doing (Pod12)*
- Health conditions and injuries	*And quite often a lot of people that have musculoskeletal injuries to their foot, I write an exercise program for swimming or non-impacting activities, like exercise bike, or cycling and so on. Some of that, if they're brand new to it, haven't really done exercise, so I tend to ….suggest exercise that can be done. (Pod1)* *…but then modifying that for people who have maybe specific health conditions that would affect their ability to do those activities, or maybe being able to provide advice on activities that would be most suitable for their health conditions (Pod2)* *I mean obviously if you've got a 60-year old female, overweight, diabetic, you don't want to suddenly say to them, 'OK, you've got to go out jogging five times a week' 'cause it's not going to happen. But if you say, 'well if you could make half an hours walk five times a week'. So, I tend to think its more physical activity is kind of tailored to the individual rather than broad-based. (Pod8)*
- Potential health and safety risks	*I mean, obviously if they're at a high risk of falling or something like that you might, yeah, suggest maybe that they do a bit of hydrotherapy rather than anything else or something like that. (Pod8)*
Where promotion to patients is more likely	
- All patients	*I don't think there's necessarily, people that I wouldn't, because I think most people would benefit from some form of physical activity. (Pod8)* *To be honest I don't think there are any groups that would be more or less likely for you to approach. (Pod4)*
- Diabetic patients	*I do actually really promote the daily activity with patients with diabetes, especially new patients that come in. I think that's really important. (Pod20)*
- Chronic disease	*circulation problems perhaps, something like that, have a bit more exercise and get the blood flowing a bit more. (Pod14)*
- Overweight patients	*a patient says to me, "I need to lose some weight," then I would say just encourage them to be more physically active. (Pod14)*
- Sedentary	*One's who are sedentary and, you know, depending on the patient of course, whether or not they're debilitated by a condition and they pretty much can't walk anyway. (Pod3)*
Where promotion is less likely	
- Patient already active	*I think when you see a lot of kids or teenagers you probably don't have to promote it as hard because the majority of them… 99% of the teenagers you see are pretty active sorts of teenagers and that's less an area where we have to promote it, as such. (Pod10)*
- Patients with serious health issues (chronically ill, chronic pain)	*You get someone with lots and lots of health problems that come in, like someone who's got cancer, and they're having treatment at the moment for cancer, they really don't want to be fussed about knowing that they should do this and that for their diabetes. And I would not be bothered. (Pod17)* *Well, certainly not someone who was in an acute phase of rheumatoid arthritis or something like that, and obviously they would say that they wouldn't be able to do anything in that situation. But I would say, "Well when things settle down, perhaps try and go for a walk or something like that." (Pod14)* *I think in severe cases of rheumatoid arthritis. For example, I have a patient right now who's constantly got inflamed bursas beneath her metatarsal heads, with chronic necrosis and sloughing and exudates, I would say she should rest, be non weight bearing at times like that. So depending on symptoms, difficulties with healing of lesions on the plantar aspect of the foot may require an adaptation. If we can't get weight deflection, they have to rest. (Pod16)* *I guess people in chronic pain can be a bit negative about physical activity, and so perhaps it's going to be harder to get them to do something than someone who's feeling reasonably fit anyway.(Pod14)* *I think patients who are having issues like they've got unstable blood pressure or their having cardiac problems, or they've had a stroke, I'm really reticent to promote physical activity if the GP isn't involved as well. (Pod20)*
- Patients with a health and safety risk	*but I think the limitation there is that there's other factors such as often there might be heart conditions involved, respiratory conditions, falls risk, (Pod2)* *it depends on the person coming in really. If it's someone who's quite high risk, multiple complex issues, I think err on the safe side, and have to be a referral off to someone who is an expert in the area. If it's someone relatively healthy, then I'd be like yep, just do it. (Pod13)*

Follow up practice and beliefs	
Informal and opportunistic approach	As far as follow up is concerned, I think that's part of just normal conversation in your consult time with patients where they're coming in for their primary problem or issue that you're managing and as part of that you'll be asking have they followed up with anything or how they're going with that program or what's been happening in their life and stuff. I think there's always that follow up and interest in people at personal level… (Pod9) Probably not formally, no. So, again it depends on the nature of what they've actually come to see me with. If it's just someone in general chit chat while I'm doing a routine consult I probably would tend to forget to follow that up unless I've made a specific note of it. (Pod3)
As part of a management plan	I think our role covers being able to follow up on it, so to be able to provide the advice, potentially prescribe in some cases, and then to follow up as part of the management plan, or at least to ensure that it's followed up by someone (Pod2)
Documentation	
Beneficial for follow up	you would recommend they come back A in six to eight weeks and then you can also, like I always make really extensive notes, so to write down exactly the patient said, what you found, what actually happened, what you plan to do and then it will be easier for you to follow up whether there's been any improvements or whether they think that things are staying the same (Pod4)
Report to general practitioner	I would just as a standard process on their medical records, I would be documenting that I've recommended or advised someone of a specific recommendations. I would often regularly write that to GPs, 'cause I suppose GPs are often the gate keeper of a lot of elephant information and feel that if I'm including aspects of that persons care or physical activity that I think the GP should be made aware of that. And it's also an opportunity to highlight that I just are considering those sorts of things outside of, you know, perhaps what a GP may think podiatrists do, so I use that as a promotional thing for podiatry as a profession I suppose, as well as me as a practitioner. (Pod6)
Management plan	Usually that's in our management plans so any of our care plans we put together for our patients, in particular for Public Health… in private practice that's just part of the medical records that you put together as part of their ongoing history and usually that's on the front page and gets updated from time to time. (Pod9) – Public podiatrist
Barriers and enablers	
Barriers	
- Time	*Well the same reason but to a lesser degree, that why the GPs aren't doing it? It's time constraint...(Pod1)* *I'm always ten minutes behind for my next patient and you treat what's in front of you and get them out the door and that I think tends to happen too much, in particular, the way I've developed my work. To give as best sort of exercise recommendation or prescription as I should in a less busy practise. I imagine I could do a lot more towards promoting exercise, and particularly in my circumstances you know of being commission based, you don't get the patients through the door, you don't get income, so... the pressures on a bit to keep the patient turnover going, so I guess my work structure is probably a bit of a barrier there. (Pod1)* *time factor with your appointments is a big thing. There are some clients you feel like you could sit here all day and talk to and encourage and do things with and then you'll suddenly go "Oh, I had them booked in for a 20 minutes appointment and we've been sitting here for 45. Far out." Sometimes you need to think… especially with new clients, if you don't know what the problem is then maybe booking them in for longer. If the person has an issue you'd really like to discuss but that wasn't what they came in for in the first place then getting them to come back or next time booking them in for longer so you can spend a lot more time with them. (Pod10)*
-Lack of resources	it's about me trying to source out where I'd get the information and think well that's useful, but more often than not you would run out of those brochures and never use them again, so it's not like I've got a permanent supply of information or brochures, or flyers or whatever available for people, so it's just a timing thing, sometimes you have it, sometimes you don't.(Pod 6)
-Lack of knowledge of activity options	*So there's a lot of resources out there, but being aware of what they are and how well they're promoted is another issues. I don't just mean me promoting it to the client, but how well they promote them to practitioners and to a great degree, unless I go and source that information it's not presented to us in any formal way, or there's no specific resource where I can go, alright, I want to promote physical activity, what location do I go to get details around that, 'cause it seems to be a pretty hotch-potch kind of, there's no integrated location that I've found anyway, that I could say, alright, I can get information personally as a practitioner or I can advise my client and say why don't you look at these areas to chase information. I suppose, for me more often than not I either stumble across them… I think time and also the reliability of what you're offering somebody. Ensuring that the information you're actually providing is individually appropriate and that you've considered a range of issues before, issues around safety and capacity and things like that before you actually…(Pod6)* *If you haven't got the information and knowledge about what's around. I'm not an expert in planning someone's physical activity program but it's knowing who you can turn to and who you can go to for appropriate referral, that's probably the biggest barrier, I think. There are lots of things you find out by yourselves but there is probably lots of other stuff out there that's going on that you don't know about either.(Pod9)* So you need to be informed yourself of what's out there so that you can promote it….then that's got to be updated all the time. (Pod7)

- Lack of skills and knowledge	*And I guess it's the fear of not being trained in a physical activity, and not having a thorough history about patients, like other in depth about their cardio, their lung function, or respiratory function, and we're talking about lots of high risk patients. (Pod13)* *I guess it all comes back to things like behavioural change and it's not an area which I've done any specific training, and it's just been touched on in different elements of thing, but not... I don't feel as though I have the skills in behavioural change...(Pod2)* *I haven't got the skills or the knowledge to look at putting together some sort of exercise program (Pod9)* *Unless you've specifically trained in a particular area and have the skills and knowledge and expertise to be able to assist patients more in that field… but for many podiatrists they probably haven't had that degree of undergraduate or possibly even postgraduate training. I think if they've got skills, knowledge and confidence in that area to be able to do it well then go for it, I think it would be great.(Pod9)* *I think time and also the reliability of what you're offering somebody. Ensuring that the information you're actually providing is individually appropriate and that you've considered a range of issues before, issues around safety and capacity and things like that before you actually…(Pod6)*
- Fear of litigation	*But I guess because there's always the fear of litigation and saying, you know I think the recommended... putting a time, and putting a number on things, and without having the evidence background, the evidence base…and people might misconstrue the message that you're trying to say. (Pod13)*
- Patient lacks motivation	*Well some people haven't got the motivation, they're lazy, they're probably the two main factors, yeah, motivation and laziness and obviously you've got to make the time, you've really got to want to do it…(Pod5)* …people that are proactive and positive and energetic and want to do everything they can to improve their health would I think... I think scenario would have a very good outcome. But the opposite to that personality or the low energy person, or the poorly motivated I'd probably expect to have a poor outcome. (Pod19)
- Patient is unreceptive	*Some clients don't want to hear it. A lot of clients are in denial and it's not exactly a disadvantage but if you over push something too much then your clients aren't necessarily going to want to return to you because they don't want to feel like they're getting a lecture every time they see you so you've got to tread carefully.(Pod10)* *The client has to be receptive to it. I'm a strong believer that no one can help you until you're prepared to help yourself and so if the client is not prepared to listen you can bash your head against a brick wall all you like. (Pod10)* *Like, you know, it's much easier to take a tablet. You're banging your head against the wall with some people, but I would still work on it. (Pod7)*
- Negative attitude to activity	*I think it's difficult to be able to categories patients, but obviously you'd have some patients that maybe less willing to participate in physical activity than others for all sorts of reasons, and it's more difficult to be able promote physical activity to that crowd, it doesn't mean that you shouldn't, but it's more difficult to.(Pod2)* *some people just don't like activity. "I don't like going running, that's just how I am." Some people don't like going walking, that's just how they are. (Pod11)*
Enablers	
- Opportunity during routine consults	*Well you've got them sitting in a chair for 20 minutes or whatever, half an hour, and you can talk about lots of things, but you can – not put them on the spot – but you can talk about things you want to.(Pod15)* *So I think we've got to, because we've got a captive audience over half an hour (Pod20)* *I think as well as podiatry, yeah, people obviously do come for that particular problem, but very quickly you start talking about other areas so, it is easier that way to rope that into it. (Pod4)* *So we can say, 'how have you been going?' Just in the course of conversation and in the course of a consultation, it's not having to put them on a spot it's just part of the general conversation that you may have. (Pod8)*
- Regular consults	*Usually they come say every six to eight weeks and perhaps we could review that with them and see whether they were able in that period to increase, or whether they decreased, what problems they had to do that or not facilitate that. And obviously that generally might motivate them or keep them on the right path and we could advise them on what other things they could do. (Pod4)* *And because of us reviewing for the nail care and so on, again and again, it's more likely that we are going to see those patients again and again...(Pod1)* *So it's kind of like the patients that we see most of the time, and we see on a regular basis, and the ones we have had opportunity to build rapport, of the really, really high risk category, and most of the patients that might potentially have room for developing that kind of relationship and recommending (Pod13)*
- Resources	*I think visual things are really good. I find, for example, I have sports shoes sitting over there and people see that and ask me about it all the time. They might not be interested in sport in particular, but they'll see the shoe and ask me why I have it there and if it's a good shoe and you use it as a visual thing to lead into conversation. Having things around that clients will ask about to stimulate conversation towards the direction you want to go, I think that helps a lot. Visual aids are good. (Pod10)* *so having the information .. whether it's some sort of brochure or a website - and bringing it all together would be the most helpful and the easiest way to be able to get information out. (Pod9)* *I think a lot more pamphlets and handouts with literature about the benefits of exercise. (Pod1)*

- Implementation of formal strategies	*I think a structured, some kind of structured plan to fitness of starting, for example, with so much walking, perhaps some weight bearing exercises. I think just a program I suppose that I haven't developed, that somebody else has developed, that has better knowledge in that area of what's appropriate. And not just for one age group, through a number of age groups as well. I don't feel I really have that, the knowledge to recommend that. So I think some guidance with that would help, that's probably the main thing, that's probably the main obstacle really. (Pod20)*
- Training	*I think I'd like to increase my skills in motivational interviewing so I would do some training in that, I think it's a good way to be able to ask people questions so they can… do that. I think chronic disease models are useful, they all have different ways of getting to the same ideas. (Pod11)* *I think getting back to the behavioural change, that's something that as Health Professions, well as a Podiatrist, we don't really get... I don't think we got any undergraduate training in it, and we learnt some basics of it …… well I feel as though I would benefit greatly from being able to do... having more skills and knowledge in that area, so whether that's a component of undergraduate degrees that should be focused on more. (Pod2)*
- Multidisciplinary team approach	*I think if I actually worked in a multidisciplinary practice it would be a lot easier, with a Physio and an Exercise Physiologist and with a GP.(Pod20) – private podiatrist*
Influencing factors	
- Desire to improve patient's health	*probably more so with diabetics, because obviously it's more important for them to keep their weight down and to do the exercise to get their blood glucose levels down and maybe reduce the need for medication (Pod5)* *I think if they're more physically active then it generally would mean they're less likely to be a complex case to manage if they're active and don't have as many co-morbidities which is probably less time consuming for a practitioner, less balls to juggle as far as management goes. (Pod11)* *I guess the advantage we'd have patients who are much more proactive about their just general health, and we'd see I guess better outcomes long term with things like diabetes and heart disease. (Pod20)* *Listen I think that that's probably the group that would promote it more in because that tends to be the group that are less active and it's going to be of more benefit to them generally in terms of all of their chronic health conditions...(Pod6)* *You get that over time with individuals, so I guess you care about them and if you can improve their quality of life you do, basically. (Pod8)* *"I think if they're more physically active then it generally would mean they're less likely to be a complex case to manage if they're active and don't have as many co-morbidities which is probably less time consuming for a practitioner, less balls to juggle as far as management goes." (Pod11)* *"I think it's really important for old people to, I guess just maintain their fitness and strength and basically stay home and keep fit and keep as well as they can for as long as they possibly can.... rather than deteriorating to a stage where they end up being shoved in a Nursing Home." (Pod20)*
- Personal and job satisfaction and achievement	*I think its satisfaction, knowing that you can... you've done something to make... you know, to try and improve someone's life. Not really... it's more of a feel good thing kind of.(Pod13)* *I'm concerned, not just about their feet, that I'm concerned about their... you know, looking a bit more holistically, looking at certainly if they're... if they lose some weight, it's easier on their feet. And yeah, I'm sort of... they might see that I'm caring for them a bit better than if I wasn't to mention and that sort for thing.(Pod14)* *why would you promote physical activity; why do I bother? You know so because it makes me feel good; because it's part of my job? (Pod15)* *Well I guess I just do it just to help people. I'm not really going to get anything – maybe it makes me feel a wee bit better, a little bit better you know.(Pod15)* *I think that's quite a positive role to play and I should think there'd be some actual benefit when that works, when you see people actually benefiting from that activity.(Pod19)* *In terms of for me as a practitioner, probably the more that you provide advice in the area, the more feedback you get from patients and the more insight you get from patients as to what works and what doesn't work for them. And I think that helps you as a practitioner. (Pod2)*
Normative influences	
- Professional development	Well of course, even just going to conferences and hearing people talk about the importance of physical activity and making changes in the community, of course that provides a level of motivation to... for us to promote physical activity. (Pod2)
- Colleagues/other health professional	…talking to other colleagues, other Podiatrists,…(Pod11)
Effectiveness of promotion	
Gauging success	

-Verbal or observational methods	I had a patient in last week who, on my advice, has been walking 20 to 30 minutes every day, has lost weight, he's medication reduced, he's really quite happy that I've got him motivated to go and walk every day, so.(Pod20) "I was trimming their nails, because they were just presenting for that, and the diabetes is out of control, to losing a lot of weight and then being able to trim their own nails and been taken off insulin for diabetes...(Pod1)
Range of beliefs about efficacy	
- Limited effect	To be honest, most people probably don't change that much at all. Most people are probably either the same every year, unless someone was on a health kick one year and the next year they're not or vice versa. (Pod12) I know a lot of people have... that I recommend exercise, who have taken up the exercise but never really talked about noticeable benefits. (Pod1)
- Follow up	I definitely see giving out the advice but the problem there is if you're not following up, not monitoring it then it often… from giving the advice you often probably stop doing it because you're not getting that feedback yourself in terms of "I'm giving this advice and have no idea whether people are taking it or implementing it. (Pod12)
- Positive effect	somebody who maybe is chronically impaired or hasn't really done a lot of exercise sometimes might go away and come back three months later and say, 'you know what? It really made an impact on us and it was on my mind for a while and actually I have started it and I feel better'. (Pod4)
Knowledge, education and skills	
Lack of pre and post registration training	Unless you've specifically trained in a particular area and have the skills and knowledge and expertise to be able to assist patients more in that field… but for many podiatrists they probably haven't had that degree of undergraduate or possibly even postgraduate training. I think if they've got skills, knowledge and confidence in that area to be able to do it well then go for it, I think it would be great. (Pod9) issues around health promotion and things would have come outside of undergraduate podiatry and I think there might have been some motivated, occasional lecturers that might have highlighted some issues, but it was by no means a formal part (Pod6) it's not a particular subject at University - or it wasn't when I went through - but it's implied in so many areas. (Pod10)
Wish for specific skills	
- Lack of behavioural counselling	I guess it all comes back to things like behavioural change and it's not an area which I've done any specific training, and it's just been touched on in different elements of thing, but not... I don't feel as though I have the skills in behavioural change...(pod 2)
- Lack of exercise program skills	I think that's where we start but certainly at this point in time I haven't got the skills or the knowledge to look at putting together some sort of exercise program (pod9) theoretically if I was going to go down the pathway of really doing proper physical assessments, I'd probably want to do a bit more continued ed, just to learn a little bit more, feel a bit more confident I guess. (Pod15)
- Motivational interview	I think I'd like to increase my skills in motivational interviewing so I would do some training in that, I think it's a good way to be able to ask people questions so they can… do that. I think chronic disease models are useful, they all have different ways of getting to the same ideas.

Appendix 5.1: Podiatrist survey invitation email

Hi podiatrist,

This email is being sent to you on behalf of researchers from the Menzies Institute for Medical Research, University of Tasmania.
We need your help in the completion of a brief online survey, which aims to gain a better understanding of podiatrists' physical activity promotion practices. Podiatrists play a role in physical activity promotion, but very little research has asked podiatrists what they think about this role. Your input will help us address this important knowledge gap by providing a comprehensive picture of the current status of podiatrists' physical activity promotion behaviours, and the perceived benefits and barriers to physical activity promotion in the podiatry setting.

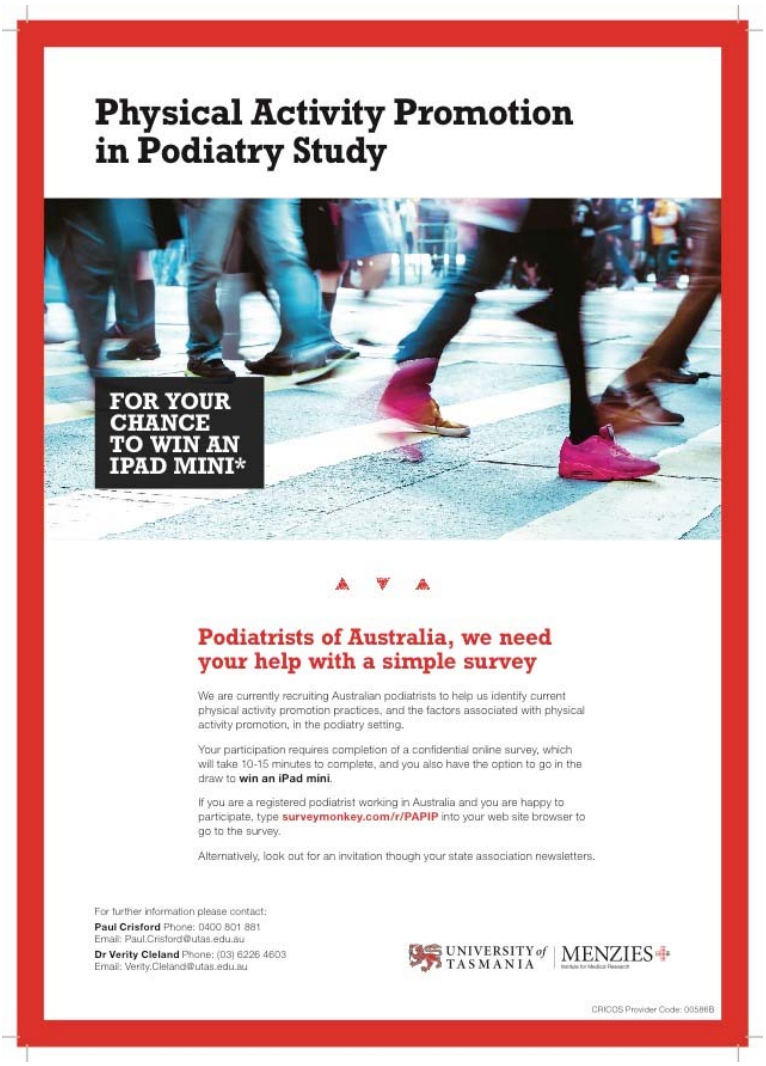
The survey will take 10-15 minutes to complete. You also have the option to go in the draw to win an iPad mini!
If you are happy to participate, please click here to be taken directly to the survey, which includes further information about the study.

Alternatively, type the following address into your web browser:
www.surveymonkey.com/r/PAPIP

And please share this with your podiatry colleagues.
We appreciate your support.

Kind regards,
Paul Crisford, Podiatrist, PhD Candidate
Professor Alison Venn, Director of Menzies Institute for Medical Research
Professor Tania Winzenberg, Professor of Chronic Disease Management
Dr Verity Cleland, Senior Research Fellow
Dr Dawn Aiken, Senior Research Fellow

Appendix 5.2: Podiatrist survey recruitment flyer



Appendix 5.3: Podiatrist survey instrument

1. **Over the last month how often did you ask new patients about their physical activity?**

Always	Often	Sometimes	Rarely	Never
○	○	○	○	○

2. **Over the last month how often did you ask established patients about their physical activity?**

Always	Often	Sometimes	Rarely	Never
○	○	○	○	○

3. **Over the last month how often did you assess your patient's physical activity level?**

Always	Often	Sometimes	Rarely	Never
○	○	○	○	○

4. **Over the last month how often did you ask new patients about their sitting time?**

Always	Often	Sometimes	Rarely	Never
○	○	○	○	○

5. **Over the last month how often did you give general physical activity advice to your patients?**

Always	Often	Sometimes	Rarely	Never
○	○	○	○	○

6. **Over the last month how often did you give specific physical activity advice to patients including advising patients about the recommended type, intensity and amount of physical activity?**

Always	Often	Sometimes	Rarely	Never
○	○	○	○	○

7. **Over the last month how often did you refer patients to other health professionals for physical activity advice or counselling?**

Always	Often	Sometimes	Rarely	Never
○	○	○	○	○

8. **Over the last month how often did you follow up on your physical activity advice with patients?**

Always	Often	Sometimes	Rarely	Never
○	○	○	○	○

9

- ◯ I don't promote physical activity and I don't intend to start
- ◯ I don't promote physical activity but I'm thinking of starting
- ◯ I promote physical activity sometimes but not regularly
- ◯ I promote physical activity regularly but just started recently
- ◯ I promote physical activity regularly (for longer than 6 months)
- ◯ I have promoted physical activity in the past but not now

10. I intend promoting physical activity to my patients over the next 6 months

Definitely not ◯ ◯ ◯ ◯ ◯ ◯ ◯ Most definitely

11. In 6 months' time, I will be promoting physical activity to my patients

Definitely not ◯ ◯ ◯ ◯ ◯ ◯ ◯ Most definitely

12. In the past week on how many days have you done a total of 30 minutes or more of physical activity, which was enough to raise your breathing rate. This may include sport, exercise, and brisk walking or cycling for recreation or to get to and from places, but should not include housework or physical activity that may be part of your job.

0 days 1 day 2 days 3 days 4 days 5 days 6 Days 7 days

13. Do you think that podiatrists' have a role in:

	Strongly disagree	Disagree	Neither disagree or agree	Agree	Strongly agree
Assessing the physical activity level of patients?	○	○	○	○	○
Providing general physical activity advice?	○	○	○	○	○
Giving specific physical activity advice to patients? Including advising patients about the recommended type, intensity and amount of physical activity.	○	○	○	○	○
Tailoring a physical activity program to the client's individual needs?	○	○	○	○	○
Carrying out activity counseling with patients (including identifying barriers to physical activity, problem solving barriers to physical activity and setting physical activity goals)?	○	○	○	○	○
Monitoring ongoing physical activity levels	○	○	○	○	○

14. I would find promoting physical activity to my patients:

Harmful						Beneficial
○	○	○	○	○	○	○

15. I would find promoting physical activity to my patients:

Useless						Useful
○	○	○	○	○	○	○

16. I would find promoting physical activity to my patients:

Unpleasant						Pleasant
○	○	○	○	○	○	○

17. I would find promoting physical activity to my patients:

Unenjoyable						Enjoyable
○	○	○	○	○	○	○

18. My peers think that I should be promoting physical activity to my patients

Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
○	○	○	○	○

19. It is expected of me that I promote physical activity to my patients

Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
○	○	○	○	○

20. I feel under social pressure to promote physical activity to my patients

Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
○	○	○	○	○

21. People who are important to me want me to promote physical activity to my patients

Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
○	○	○	○	○

22. Patients think I should promote physical activity

Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
○	○	○	○	○

23. How often do the following barriers prevent you from promoting physical activity to your patients?

	Never	Rarely	Sometimes	Often	Very often
A lack of time	○	○	○	○	○
A lack of physical activity promotional skills or knowledge	○	○	○	○	○
A lack of remuneration for promoting physical activity	○	○	○	○	○
Feeling it would not change the patient's behaviour	○	○	○	○	○
Feeling it would not be beneficial for the patient	○	○	○	○	○
A lack of resources (handouts, posters, prescriptions)	○	○	○	○	○
A lack of physical activity promotion guidelines	○	○	○	○	○
Low level of patient interest in physical activity	○	○	○	○	○
The chance that the physical activity advice you give puts the patient at risk	○	○	○	○	○

24. How confidence do you feel in the following?

	Not at all confident	Somewhat confident	Unsure	Confident	Very confident
Assessing the physical activity level of patients?	○	○	○	○	○
Providing general physical activity advice?	○	○	○	○	○
Discussing activity options with patients?	○	○	○	○	○
Providing specific physical activity advice? Including advising patients about the recommended type, intensity and amount of physical activity.	○	○	○	○	○
Carrying out activity counseling with patients (including identifying barriers to physical activity, problem solving barriers to physical activity and setting physical activity goals)?	○	○	○	○	○
Monitoring ongoing physical activity levels?	○	○	○	○	○

25. For me to promote physical activity to my patients would be:

Very easy	Somewhat easy	Neither easy or difficult	Somewhat difficult	Very difficult
○	○	○	○	○

26. How much control do you have over your physical activity promotion

No control	Very little control	Unsure	Some control	Complete control
○	○	○	○	○

27. Have you received training on physical activity promotion at undergraduate level?

- ◯ Yes
- ◯ No

28. Have you received training on physical activity promotion or attended workshops or seminars on physical activity promotion since graduating?

- ◯ Yes
- ◯ No

29. Would you like to receive training or education on physical activity promotion?

- ◯ Yes
- ◯ No

30. What type/s of physical activity promotion information and or education would you consider most beneficial for you? (Select all that apply)

- The benefits of physical activity
- Physical activity assessment
- Physical activity promotion
- Physical activity prescription
- Monitoring patient's physical activity
- Physical activity counselling techniques
- Motivational interviewing techniques
- Behavioural modification techniques
- Other (please specify)

31. In what format would you prefer to receive physical activity promotion information and or education? (Select all that apply)

- Via email
- Posters and handouts
- Webinar
- Lecture as part of a conference
- 1/2 day workshop
- 2 day intensive workshop
- Other (please specify)

32. How many years have you been a podiatrist?

33. Are you male or female?

- ◯ Male Female

34. What is your age?

- ◯ 20-29
- ◯ 30-39
- ◯ 40-49
- ◯ 50-59
- ◯ 60 or older

35. What best describes the majority of your work context?

- ◯ Private
- ◯ Public
- ◯ Community
- ◯ Educational/Academic

Appendix 5.4: Podiatrist survey information sheet

Introduction
Physical inactivity has become a very serious health and well-being problem and consequently all health professionals are encouraged to promote physical activity to their patients. Previous research tells us that there is an opportunity for podiatrists to play an important role in promoting physical activity. However, there is limited information about the current status of physical activity promotion in the podiatry setting and the factors associated with it. Your participation will help us gain a comprehensive picture of the role of podiatrists in physical activity promotion and the results obtained will be of great value in helping to develop the role.

Do I have to take part in this research study?
Your involvement in this study is completely voluntary. You can submit the survey once only. You can amend your answers prior to submission at the end of the survey, however, please note that you will not be able to withdraw your responses once the survey has been finally submitted.

How long does it take to complete this survey?
Depending on the answers that you provide, this survey may take between 5 and 15 minutes.

What are the possible benefits from participation in this study?
While you will not experience any direct benefits from participation, this study will provide information that will give us a better understanding of the role of podiatrists in physical activity promotion. Such information will help to enhance podiatrists' roles and may be beneficial in targeting interventions to assist you in delivering physical activity promotion. Feedback on the outcomes of this study will be available through a summary report and through published scientific papers.

What are the risks of participation?
There are no foreseeable risks associated with participating in this study. The researchers will maintain confidentiality and any information you supply will be used for the purposes of the research only. The results of the study will be published so that you cannot be identified as a participant. All electronic data will be kept in a separate password protected secure database, only accessible by the researchers, with a unique identifier for each participant. All research data will be destroyed after five years.

What if I have questions about this research?
If you would like to discuss any aspect of this study, please feel free to contact Dr Verity Cleland on ph (03) 6226 4603. Alternatively, you can contact us via email at Verity.Cleland@utas.edu.au or Paul.Crisford@utas.edu.au

Ethics
The Tasmanian Social Science Human Research Ethics Committee has approved this study. If you have concerns or complaints about the conduct of this study you should contact the Executive Officer of the HREC (Tasmania) on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote H0015261.
If you have read and understood the information provided about this national survey, any questions that you have asked have been answered to your satisfaction and you agree to participate, please click "Yes" at the bottom of this page.

Appendix 5.5: Podiatrist survey correlation table

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
1 Give General Advice	1																																																								
2 Give Specific Advice	0.61	1																																																						
3 Refer Patients	0.33	0.44	1																																																					
4 Followup Patients	0.51	0.67	0.49	1																																																				
5 Ask New Patients	0.47	0.47	0.23	0.39	1																																																			
6 Ask Established Patients	0.59	0.57	0.35	0.55	0.59	1																																																	
7 Assess PA	0.40	0.47	0.32	0.48	0.28	0.42	1																																																
8 Ask about Sitting	0.43	0.47	0.37	0.47	0.36	0.50	0.38	1																																														
9 Intention over 6 months	0.52	0.54	0.33	0.45	0.47	0.52	0.32	0.26	1																																													
10 Intention in 6 months	0.57	0.50	0.39	0.45	0.46	0.52	0.32	0.27	0.91	1																																												
11 Beneficial	0.47	0.30	0.27	0.20	0.29	0.28	0.24	0.20	0.53	0.58	1																																											
12 Useful	0.44	0.40	0.24	0.28	0.39	0.36	0.29	0.19	0.57	0.55	0.80	1																																										
13 Pleasant	0.50	0.46	0.27	0.35	0.45	0.50	0.33	0.25	0.55	0.58	0.56	0.54	1																																									
14 Enjoyable	0.46	0.49	0.27	0.38	0.43	0.48	0.38	0.31	0.57	0.55	0.48	0.55	0.87	1																																								
15 Appreciate	0.42	0.38	0.29	0.30	0.40	0.38	0.33	0.26	0.41	0.43	0.36	0.38	0.59	0.56	1																																							
16 Satisfied	0.34	0.42	0.30	0.33	0.33	0.35	0.31	0.23	0.56	0.51	0.42	0.46	0.53	0.58	0.51	1																																						
17 Efficacy	0.33	0.38	0.34	0.39	0.31	0.34	0.35	0.19	0.40	0.38	0.23	0.34	0.42	0.49	0.54	0.53	1																																				
18 Peers Norm	0.18	0.30	0.22	0.32	0.24	0.24	0.25	0.15	0.35	0.30	0.21	0.26	0.19	0.23	0.25	0.25	0.29	1																																				
19 Expected Norm	0.38	0.34	0.23	0.31	0.33	0.36	0.26	0.24	0.40	0.40	0.31	0.30	0.31	0.26	0.38	0.24	0.31	0.57	1																																			
20 Colleagues Norm	0.35	0.19	0.22	0.27	0.28	0.28	0.29	0.15	0.35	0.37	0.30	0.28	0.30	0.27	0.37	0.29	0.29	0.46	0.54	1																																		
21 Important People Norm	0.33	0.28	0.29	0.30	0.30	0.33	0.23	0.21	0.41	0.44	0.36	0.36	0.40	0.37	0.45	0.40	0.40	0.57	0.59	0.59	1																																	
22 Patients Norm	0.36	0.36	0.25	0.35	0.34	0.39	0.27	0.24	0.41	0.43	0.34	0.36	0.43	0.40	0.47	0.37	0.43	0.51	0.65	0.50	0.63	1																																
23 Confidence PA Assess	0.36	0.33	0.12	0.29	0.24	0.34	0.31	0.25	0.28	0.34	0.26	0.25	0.37	0.38	0.25	0.23	0.23	0.17	0.29	0.25	0.32	0.34	1																														
24 Confidence General Advice	0.37	0.35	0.11	0.24	0.25	0.25	0.15	0.23	0.35	0.35	0.33	0.33	0.29	0.30	0.17	0.28	0.19	0.23	0.25	0.22	0.28	0.33	0.55	1																												
25 Confidence PA Options	0.38	0.29	0.15	0.26	0.20	0.22	0.11	0.15	0.27	0.35	0.32	0.28	0.30	0.23	0.20	0.20	0.15	0.13	0.23	0.27	0.23	0.28	0.48	0.71	1																										
26 Confidence Specific Advice	0.40	0.49	0.15	0.38	0.30	0.39	0.31	0.23	0.39	0.36	0.27	0.34	0.35	0.40	0.29	0.30	0.28	0.23	0.29	0.23	0.29	0.37	0.60	0.60	0.57	1																								
27 Confidence Counsel	0.48	0.45	0.16	0.46	0.34	0.45	0.31	0.31	0.40	0.43	0.30	0.31	0.34	0.36	0.27	0.31	0.25	0.24	0.34	0.26	0.32	0.39	0.62	0.52	0.52	0.71	1																						
28 Confidence Monitor	0.38	0.37	0.14	0.45	0.27	0.35	0.34	0.31	0.38	0.38	0.24	0.30	0.34	0.40	0.31	0.35	0.35	0.31	0.29	0.29	0.33	0.37	0.59	0.52	0.43	0.61	0.68	1																				
29 Easy	0.43	0.47	0.21	0.39	0.35	0.43	0.30	0.28	0.46	0.43	0.31	0.37	0.51	0.52	0.41	0.36	0.34	0.21	0.24	0.16	0.25	0.31	0.40	0.32	0.28	0.38	0.45	0.43	1																		
30 Control Over	0.21	0.20	0.07	0.13	0.17	0.17	0.12	0.11	0.25	0.24	0.17	0.19	0.23	0.26	0.18	0.28	0.20	0.09	0.15	0.09	0.18	0.17	0.28	0.33	0.23	0.23	0.27	0.31	0.29	1																	
31 Knowledge	0.42	0.49	0.23	0.41	0.31	0.43	0.30	0.28	0.49	0.46	0.34	0.39	0.41	0.43	0.32	0.33	0.31	0.23	0.28	0.23	0.29	0.33	0.58	0.55	0.47	0.67	0.55	0.49	0.47	0.33	1																
32 Skills	0.46	0.44	0.25	0.37	0.28	0.39	0.27	0.28	0.47	0.51	0.39	0.32	0.42	0.42	0.30	0.31	0.25	0.16	0.29	0.26	0.29	0.37	0.62	0.58	0.55	0.59	0.62	0.52	0.40	0.32	0.77	1															
33 Undergraduate Training	0.14	0.21	0.06	0.22	0.10	0.12	0.12	0.09	0.19	0.20	0.14	0.14	0.13	0.14	0.11	0.14	0.18	0.11	0.15	0.09	0.12	0.18	0.26	0.21	0.22	0.31	0.31	0.28	0.13	0.06	0.24	0.26	1														
34 Postgraduate Training	0.31	0.29	0.18	0.32	0.25	0.37	0.32	0.23	0.34	0.34	0.23	0.26	0.26	0.28	0.23	0.21	0.25	0.23	0.24	0.20	0.24	0.33	0.36	0.21	0.16	0.36	0.39	0.33	0.27	0.09	0.40	0.38	0.11	1													
35 Role Assess	0.39	0.41	0.20	0.37	0.37	0.39	0.34	0.36	0.42	0.38	0.31	0.36	0.35	0.39	0.34	0.39	0.39	0.32	0.37	0.33	0.43	0.42	0.45	0.35	0.21	0.37	0.47	0.48	0.41	0.20	0.35	0.33	0.16	0.33	1												
36 Role General Advice	0.46	0.37	0.21	0.32	0.36	0.37	0.30	0.30	0.48	0.50	0.44	0.40	0.40	0.34	0.43	0.38	0.34	0.31	0.47	0.45	0.51	0.48	0.32	0.38	0.32	0.33	0.38	0.36	0.31	0.13	0.29	0.32	0.15	0.25	0.59	1											
37 Role Specific Advice	0.41	0.48	0.22	0.42	0.36	0.37	0.29	0.28	0.48	0.42	0.32	0.39	0.34	0.38	0.34	0.36	0.38	0.33	0.41	0.34	0.41	0.45	0.37	0.38	0.29	0.54	0.46	0.42	0.30	0.20	0.41	0.38	0.20	0.36	0.56	0.49	1										
38 Role Tailor PA	0.34	0.47	0.21	0.43	0.30	0.35	0.37	0.27	0.41	0.36	0.25	0.34	0.32	0.37	0.34	0.35	0.36	0.27	0.32	0.32	0.37	0.41	0.35	0.36	0.30	0.54	0.46	0.41	0.26	0.17	0.40	0.39	0.22	0.40	0.47	0.45	0.72	1									
39 Role Counsel	0.38	0.39	0.23	0.37	0.33	0.38	0.34	0.29	0.43	0.41	0.34	0.38	0.35	0.37	0.34	0.37	0.33	0.34	0.36	0.35	0.46	0.44	0.41	0.35	0.27	0.43	0.53	0.41	0.30	0.21	0.33	0.36	0.17	0.38	0.56	0.53	0.63	0.66	1								
40 Role Monitor	0.40	0.37	0.29	0.46	0.35	0.36	0.35	0.33	0.46	0.46	0.36	0.40	0.33	0.35	0.31	0.36	0.38	0.40	0.43	0.45	0.47	0.44	0.40	0.39	0.31	0.38	0.52	0.57	0.33	0.20	0.33	0.35	0.15	0.34	0.62	0.58	0.57	0.59	0.67	1							
41 starter ime	0.23	0.23	0.20	0.30	0.21	0.21	0.23	0.17	0.19	0.21	0.14	0.09	0.21	0.17	0.17	0.18	0.16	0.09	0.12	0.09	0.17	0.15	0.11	0.02	0.12	0.20	0.24	0.13	0.36	0.10	0.17	0.14	0.05	0.13	0.16	0.13	0.13	0.11	0.10	0.15	1						
42 Barrier Skill	0.42	0.42	0.21	0.40	0.27	0.36	0.27	0.23	0.37	0.42	0.28	0.28	0.35	0.32	0.21	0.23	0.16	0.04	0.21	0.13	0.20	0.22	0.43	0.30	0.31	0.46	0.50	0.33	0.42	0.19	0.54	0.50	0.28	0.33	0.25	0.24	0.27	0.23	0.26	0.18	0.41	1					
43 Barrier Money	0.13	0.10	0.14	0.18	0.18	0.14	0.09	0.13	0.11	0.14	0.04	0.02	0.12	0.09	0.13	0.09	0.11	0.12	0.15	0.08	0.15	0.20	0.03	0.02	0.06	-0.02	0.11	0.09	0.20	0.12	0.03	0.08	0.05	0.09	0.07	0.15	0.04	0.05	0.10	0.16	0.38	0.21	1				
44 Barrier Patient Behaviour	0.25	0.32	0.29	0.31	0.24	0.30	0.22	0.25	0.30	0.32	0.16	0.20	0.38	0.35	0.42	0.27	0.36	0.14	0.23	0.12	0.23	0.30	0.08	0.00	0.06	0.12	0.18	0.23	0.35	0.20	0.18	0.18	0.02	0.16	0.20	0.24	0.22	0.15	0.13	0.18	0.28	0.24	0.34	1			
45 Barrier Patient Benefit	0.16	0.10	0.08	0.01	0.11	0.08	0.03	0.06	0.14	0.19	0.19	0.12	0.13	0.09	0.19	0.16	0.08	0.09	0.09	0.08	0.13	0.08	0.03	0.04	0.11	0.08	0.10	0.08	0.12	0.04	0.07	0.13	-0.01	0.01	0.08	0.15	0.00	-0.03	-0.01	0.08	0.11	0.06	0.04	0.27	1		
46 Barrier Resources	0.25	0.27	0.27	0.34	0.19	0.30	0.32	0.22	0.21	0.26	0.15	0.16	0.28	0.22	0.21	0.14	0.12	0.08	0.19	0.14	0.20	0.25	0.26	0.13	0.16	0.23	0.28	0.22	0.30	0.13	0.35	0.35	0.19	0.27	0.19	0.14	0.24	0.23	0.19	0.20	0.32	0.53	0.26	0.36	0.16	1			
47 Barrier Guidelines	0.33	0.36	0.24	0.44	0.29	0.40	0.36	0.30	0.28	0.32	0.16	0.18	0.31	0.30	0.26	0.18	0.22	0.11	0.22	0.15	0.21	0.26	0.38	0.21	0.22	0.37	0.44	0.37	0.38	0.16	0.46	0.42	0.29	0.33	0.30	0.27	0.32	0.31	0.26	0.27	0.32	0.63	0.27	0.39	0.18	0.76	1		
48 Barrier Patient Interest	0.22	0.29	0.19	0.25	0.23	0.27	0.18	0.26	0.25	0.26	0.16	0.18	0.34	0.31	0.34	0.21	0.34	0.10	0.18	0.17	0.24	0.29	0.17	0.12	0.12	0.21	0.21	0.21	0.31	0.17	0.25	0.20	0.17	0.15	0.21	0.22	0.24	0.21	0.19	0.23	0.26	0.22	0.26	0.56	0.11	0.34	0.37	1			
49 Barrier Risk	0.26	0.29	0.08	0.19	0.20	0.22	0.22	0.14	0.24	0.28	0.25	0.21	0.32	0.30	0.24	0.19	0.25	0.16	0.16	0.11	0.22	0.21	0.28	0.21	0.24	0.34	0.31	0.26	0.31	0.13	0.36	0.35	0.15	0.17	0.21	0.20	0.25	0.19	0.18	0.14	0.19	0.35	0.08	0.23	0.29	0.27	0.38	0.29	1		
50 Female	-0.08	-0.17	0.08	-0.07	0.01	-0.08	-0.16	-0.03	-0.03	0.00	-0.01	-0.08	-0.07	-0.10	-0.12	-0.03	-0.18	-0.06	-0.12	-0.06	-0.11	-0.10	-0.14	-0.13	-0.10	-0.22	-0.10	-0.14	-0.12	-0.03	-0.17	-0.14	-0.10	-0.15	-0.07	-0.07	-0.12	-0.18	-0.06	-0.02	0.01	-0.15	0.03	-0.02	-0.04	-0.15	-0.22	-0.03	-0.15	1						
51 Age	0.01	-0.01	0.01	-0.01	0.03	0.06	0.03	-0.01	0.03	0.03	0.10	0.08	0.03	-0.01	0.06	-0.01	0.04	0.02	0.16	0.02	0.06	0.11	-0.06	-0.19	-0.13	-0.09	-0.07	-0.15	0.02	-0.06	-0.03	-0.09	-0.20	0.21	0.11	0.11	0.07	0.01	0.05	-0.07	0.10	0.04	0.10	0.14	0.03	0.11	0.13	0.03	0.16	-0.06	1				
52 Pod Years	-0.04	-0.05	0.00	-0.04	0.00	0.02	-0.02	-0.05	-0.04	-0.03	0.06	0.02	-0.01	-0.05	0.02	-0.04	-0.01	0.01	0.09	-0.02	0.02	0.06	-0.08	-0.15	-0.10	-0.10	-0.11	-0.18	-0.03	-0.07	-0.02	-0.10	-0.31	0.22	0.06	0.05	0.05	-0.01	0.01	-0.08	0.07	0.00	0.08	0.08	0.02	0.06	0.07	-0.01	0.12	-0.04	0.86	1			
53 PA Behaviour	0.12	0.18	0.10	0.13	0.08	0.18	0.11	0.10	0.18	0.14	0.12	0.15	0.18	0.18	0.10	0.13	0.07	0.12	0.02	0.03	0.08	0.08	0.12	0.10	0.09	0.19	0.14	0.17	0.27	0.05	0.18	0.16	0.07	0.14	0.18	0.15	0.09	0.03	0.11	0.08	0.06	0.20	0.08	0.07	0.04	0.11	0.15	0.01	0.06	-0.08	-0.02	-0.03	1		
54 Private	0.02	0.10	0.04	-0.04	0.00	0.03	0.11	0.02	0.06	0.10	0.12	0.06	0.07	0.05	0.13	0.00	0.01	-0.02	-0.06	-0.03	-0.01	0.02	0.06	-0.03	0.02	0.06	0.07	-0.04	0.02	-0.16	0.06	0.08	-0.08	0.07	-0.05	-0.01	-0.02	0.05	0.00	-0.08	0.07	0.05	-0.07	-0.03	0.16	0.02	-0.02	0.03	0.17	-0.18	0.09	0.10	-0.06	1		
55 Public	-0.03	-0.07	0.01	0.11	0.02	0.03	-0.10	0.03	0.00	-0.04	-0.11	-0.05	-0.04	-0.02	-0.12	-0.04	-0.02	0.09	0.06	0.03	0.02	0.04	-0.02	0.01	-0.07	-0.08	-0.06	0.04	0.01	0.13	-0.06	-0.06	0.01	-0.02	0.06	-0.03	0.05	-0.04	0.00	0.04	-0.03	-0.02	0.12	0.02	-0.18	0.00	0.03	-0.09	-0.17	0.17	-0.05	-0.07	0.12	-0.79	1		
56 Community	-0.07	-0.07	-0.12	-0.10	-0.07	-0.09	-0.06	-0.11	-0.15	-0.16	-0.05	-0.05	-0.10	-0.10	-0.06	0.00	-0.07	-0.06	-0.03	-0.07	-0.05	-0.13	-0.06	0.01	0.00	-0.04	-0.03	-0.05	0.00	0.06	-0.04	-0.07	0.07	-0.08	-0.02	0.02	-0.07	-0.08	-0.03	0.00	-0.09	-0.09	-0.01	-0.02	-0.07	-0.05	-0.04	0.05	-0.05	0.12	-0.05	-0.05	-0.04	-0.42	-0.07	1	
57 Academic	0.07	0.00	0.01	0.00	0.04	-0.03	0.00	0.02	0.03	0.03	-0.01	0.03	0.04	0.04	-0.01	0.08	0.10	-0.05	0.06	0.10	0.05	0.01	-0.03	0.03	0.08	0.05	0.01	0.07	-0.06	0.06	0.00	0.02	0.09	-0.03	0.03	0.06	0.03	0.07	0.04	0.10	0.02	0.04	-0.07	0.06	0.05	0.00	0.01	0.05	0.00	-0.05	-0.05	-0.06	-0.07	-0.34	-0.05	-0.03	1

PA = Physical Activity

All correlations p < 0.01 unless shaded

p < 0.05

not significant

Appendix 6.1: Patient survey podiatrist invitation email

Dear podiatrist,

This email is being sent to you on behalf of researchers from the Menzies Institute for Medical Research, University of Tasmania.

Thank you for your recent support in filling out our survey on physical activity promotion in the podiatry setting. Your input will help us to address this important knowledge gap by providing a comprehensive picture of the current status of podiatrists' physical activity promotion behaviours, and the perceived benefits and barriers to physical activity promotion in the podiatry setting.

You have shown interest in being involved in further studies and therefore we would like to invite you to be part of a unique study into patients' perceptions of podiatrists' physical activity promotion.

The patient's view of the podiatrist's role in promoting physical activity and their influence on the delivery of podiatrists' physical activity promotion is unknown. Patients' views would provide a more comprehensive understanding of the podiatrist's role in physical activity promotion. This information would be of interest when targeting strategies such as better-informed interventions aimed at increasing promotion, supporting the role and improving the success of delivery.

The study involves asking podiatry patients to complete a self-administered questionnaire after exiting their podiatry consult to elicit their perceptions of physical activity, the podiatrist's role in physical activity promotion and their recall of physical activity promotion.

We are aiming to recruit twenty patients per practice to complete the survey over several days.

The survey and procedures are designed to be simple and uncomplicated to minimise disruption to any clinic activities. The survey takes about 10-15 minutes to complete. A researcher will be onsite to help recruit and administer the survey.

If you are interested in participating, or you would like further information about the study please contact us by email at Paul.Crisford@utas.edu.au or Verity.Cleland@utas.edu.au or by phone on (03) 62.. .....

Thank you again for your support.

Kind regards,

Paul Crisford, Podiatrist PhD Candidate
Professor Alison Venn, Director of Menzies Institute for Medical Research
Professor Tania Winzenberg, Professor of Chronic Disease Management
Dr Verity Cleland, Senior Research Fellow
Dr Dawn Aiken, Senior Research Fellow

Appendix 6.2: Patient survey instrument

Introduction
We are interested in finding out about your perceptions and experiences of discussing physical activity with your podiatrist. Your participation will help us gain a comprehensive picture of the role of podiatrists in physical activity promotion and the results obtained will be of great value in helping to develop the role.

What does participating in this study involve?
It involves completing an online survey on your recollection of physical activity promotion given by podiatrists and your beliefs about physical activity and physical activity promotion. This survey may take about 15 to 20 minutes to complete.

Do I have to take part in this research study?
Your involvement in this study is completely voluntary. You can amend your answers prior to submission at the end of the survey, however, please note that you will not be able to withdraw your responses once the survey has been finally submitted.

What are the possible benefits from participation in this study?
While you will not experience any direct benefits from participation, this study will provide information that will give us a better understanding of the role of podiatrists in physical activity promotion. Such information will help to enhance podiatrists' roles and may be beneficial in targeting interventions to assist you in delivering physical activity promotion. Feedback on the outcomes of this study will be available through a summary report and through published scientific papers.

What are the risks of participation?
There are no foreseeable risks associated with participating in this study. The researchers will maintain confidentiality and any information you supply will be used for the purposes of the research only. The results of the study will be published so that you cannot be identified as a participant. All electronic data will be kept in a separate password protected secure database, only accessible by the researchers, with a unique identifier for each participant. All research data will be destroyed after five years.

What if I have questions about this research?
If you would like to discuss any aspect of this study please feel free to contact either Paul Crisford on ph (03) 6226 7700 or Dr Verity Cleland on ph (03) 6226 4603. Alternatively, you can contact us via email at Verity.Cleland@utas.edu.au or Paul.Crisford@utas.edu.au

Ethics
The Tasmanian Social Science Human Research Ethics Committee has approved this study. If you have concerns or complaints about the conduct of this study you should contact the Executive Officer of the HREC (Tasmania) on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote H0016688 W.

What is the primary reason for your visit? today?

You can choose more than one answer

- ☐ Nail care
- ☐ Callus or corn removal
- ☐ Diabetes assessment
- ☐ Footwear advice
- ☐ Gait assessment
- ☐ Foot pain assessment and or treatment
- ☐ Leg, knee, hip or back pain assessment and /or treatment
- ☐ Orthotic therapy
- ☐ Follow up of previous treatment
- ☐ Prefer not to answer
- ☐ Other

Other (please specify) _____

Is this your first visit to a podiatrist?

- ◯ Yes
- ◯ No

How long have you been visiting podiatrists?

- ◯ Less than 6 months
- ◯ At least 6 months but less than 1 year
- ◯ At least 1 year but less than 3 years
- ◯ At least 3 years but less than 5 years
- ◯ 5 years or more

In the last 12 months, how many times did you visit a podiatrist?

◯ None ◯ 1 Time ◯ 2 ◯ 3 ◯ 4

◯ 5 ◯ 6 - 11 ◯ 12 times or more times

Have you always seen the same podiatrist?

- ◯ Yes
- ◯ Most of the time
- ◯ Some of the time
- ◯ No

Are you new to this practice?

- ◯ Yes
- ◯ No

In the last 12 months, how many times did you visit this practice?

- ◯ None
- ◯ 1 Time
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6 -11
- ◯ 12 or more times

How long have you been visiting this practice?

- ◯ Less than 6 months
- ◯ At least 6 months but less than 1 year
- ◯ At least 1 year but less than 3 years
- ◯ At least 3 years but less than 5 years
- ◯ 5 years or more

Has your podiatrist asked about or discussed your physical activity with you:

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Has a podiatrist asked about or discussed your physical activity with you:

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

Has your podiatrist advised you to become more physically active:

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Has a podiatrist advised you to become more physically active:

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

Has your podiatrist discussed what reasons you might have to want to become more physically active:

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Has a podiatrist discussed what reasons why you might have to want to become more physically active:

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

Has your podiatrist discussed your past experiences with physical activity:

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Has a podiatrist discussed your past experiences with physical activity:

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

Has your podiatrist discussed difficult situations you might encounter or problems you might have in trying to become more physically active:

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Has a podiatrist discussed difficult situations you might encounter or problems you might have in trying to become more physically active:

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

Has your podiatrist discussed how often you should you be physically active (For example, every day, 5 days a week, once a week):

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Has a podiatrist discussed how often you should be physically active (For example, every day, 5 days a week, once a week):

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

Has your podiatrist discussed the length of time you should spend being physically active (For example the number of minutes you need to exercise):

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Has a podiatrist discussed the length time you should spend being physically active (For example the number of minutes you need to exercise):

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

Has your podiatrist discussed the level of intensity during physical activity (For example, how hard you should exercise):

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Has a podiatrist discussed the level of intensity during physical activity (For example, how hard you should exercise):

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

Has your podiatrist discussed options for physical activity (For example walking, riding a bike, swimming, lifting weights, group activities):

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Has a podiatrist discussed options for physical activity (For example walking, riding a bike, swimming, lifting weights, group activities):

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

Have you and your podiatrist put the plan to become more physically active in writing (or as a printout, or as a prescription):

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Have you and a podiatrist put the plan to become more physically active in writing (or as a printout, or as a prescription):

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

Has your podiatrist stated that he/she is planning to discuss your physical activity on a future visit:

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Has a podiatrist stated that he/she is planning to discuss your physical activity on a future visit:

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

Has your podiatrist referred you to programs or other health or exercise professionals to help you with physical activity:

In TODAY'S consultation?

◯ No ◯ Yes ◯ Cannot recall

Has a podiatrist ever referred you to programs or other health or exercise professionals to help you with physical activity:

In PREVIOUS consultations over the last 12 months?

◯ No ◯ Yes ◯ Cannot recall

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
"The podiatrist's physicalactivity advice is useful for me"	◯	◯	◯	◯	◯
"I am satisfied with the physical activity promotion advice I have received from the podiatrist"	◯	◯	◯	◯	◯
"The podiatrist's physical activity advice will help me become more physically active"	◯	◯	◯	◯	◯
"I expect to act on the podiatrist's physical activity advice"	◯	◯	◯	◯	◯
"I want to act on the podiatrist's physical activity advice"	◯	◯	◯	◯	◯
"I intend to act on the podiatrist's physical activity advice"	◯	◯	◯	◯	◯

Who do you think should be responsible for providing patients with guidance or support on physical activity? You can pick as many as you like.

- ☐ Psychologists
- ☐ Practice assistants
- ☐ Podiatrists
- ☐ Physiotherapists
- ☐ Osteopaths
- ☐ Occupational therapists
- ☐ Nurses
- ☐ Nurse practitioners
- ☐ Medical specialists
- ☐ Gym instructors
- ☐ General practitioners
- ☐ Dieticians
- ☐ Dentists
- ☐ Exercise physiologists
- ☐ Chiropractors

Other (please specify) _____

How much do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
Podiatrists have a role in assessing the physical activity level of their patients	◯	◯	◯	◯	◯
Podiatrists have a role in providing general physical activity advice to their patients	◯	◯	◯	◯	◯
Podiatrists have a role in giving specific physical activity advice to their patients (Including giving advice on the type of, how often, and how hard the physical activity)	◯	◯	◯	◯	◯
Podiatrists have a role in tailoring a physical activity program to a patient's individual needs	◯	◯	◯	◯	◯
Podiatrists have a role in carrying out activity counseling with their patients (including identifying barriers to physical activity, problem-solvingbarriers to physical activity and setting physical activity goals)	◯	◯	◯	◯	◯
Podiatrists have a role in monitoring ongoing physical activity levels of patients	◯	◯	◯	◯	◯

In the past week, on how many days have you done a total of 30 minutes or more of physical activity, which was enough to raise your breathing rate. This may include sport, exercise, and brisk walking or cycling for recreation or to get to and from places, but should not include housework or physical activity that may be part of your job.

◯ 0 Days ◯ 1 Day ◯ 2 Days ◯ 3 Days ◯ 4 Days ◯ 5 Days ◯ 6 Days ◯ 7 Days

Which statement best describes you?

(Here, we define 'regular physical activity' as participating in 30 minutes or more per day on at least five days per week)

◯ I currently do not engage in regular physical activity and I am not thinking about starting

◯ I currently do not engage in regular physical activity but I am thinking about starting

◯ I currently engage in some physical activity but not on a regular basis

◯ I currently engage in regular physical activity and I have done so for longer than six months

How much do you agree with the following statements?

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
"It is likely that I will be more physically active in the next12 months"	○	○	○	○	○
"I intend to be more physically active in the next 12 months"	○	○	○	○	○
"Being more physically active in the next 12 months would be good for me"	○	○	○	○	○
"For me, being more physically active in the next 12 months would be harmful"	○	○	○	○	○
"For me, being more physically active in the next 12 months would be enjoyable"	○	○	○	○	○
"For me, being more physically active in the next 12 months would be boring"	○	○	○	○	○

What is your gender?

- ○ Male
- ○ Female
- ○ Prefer not to specify
- ○ Other

Other (please specify) _____

What is your age?

- ○ 15-19
- ○ 20-29
- ○ 30-39
- ○ 40-49
- ○ 50-59
- ○ 60-69
- ○ 70-79
- ○ 80-89
- ○ 90 or older

Which of the following describes your current employment status? You can pick more than one.

- ○ Working full-time
- ○ Working part-time
- ○ Not working (but not retired)
- ○ Home duties
- ○ Retired
- ○ Full-time student
- ○ Part-time student
- ○ Permanently unable to work / ill

What is your highest level of education you have completed? (select only one answer)

- ◯ Primary school
- ◯ Year 7, 8 or 9 or equivalent
- ◯ Year 10 or equivalent
- ◯ Year 11 or equivalent
- ◯ Year 12 or equivalent
- ◯ Trade / apprenticeship (e.g. chef, hairdresser)
- ◯ Certificate / diploma (e.g. child care, technician)
- ◯ University degree
- ◯ Higher university degree (e.g. Grad Dip, Masters,PhD)

What is your postcode? _____

What is your height in centimetres? _____

OR what is your height in inches? _____

What is your weight in kilograms? _____

OR what is your weight in pounds? _____

In general, would you say health is excellent, very good, good, fair or poor?

- ◯ Excellent
- ◯ Very good
- ◯ Good
- ◯ Fair
- ◯ Poor

Do you have any of the following chronic health conditions?

- ☐ Diabetes
- ☐ Hypertension
- ☐ Cancer
- ☐ Depression
- ☐ Arthritis
- ☐ Stroke
- ☐ Heart disease
- ☐ High cholesterol
- ☐ None of the above

Other (please specify) _____

Are you a smoker?

- ◯ Yes
- ◯ No

Submitting this survey confirms your consent for the information you have provided to be used in this research

◯ I agree